Gas Journal

FEBRUARY 26, 1936

Vol. 213 88th Year No. 3797

Editorial Notes

A National Fuel Policy

The question of co-ordinating the fuel industries of the country has again been brought forward for earnest discussion. A National Fuel Board was included in the proposals of the Samuel Commission of 1926, and similar proposals have been made by others, notably by the late Sir Arthur Duckham and Dr. E. W. Smith. In spite of all suggestions, however, we have remained faithful to the old order of things, which, if regarded logically, is passing strange. What answer is to be given when asked why gas should be under the wing of the Board of Trade, why the doings of the electrical industry should be governed by the Ministry of Transport, and why coal, the basic material of both these industries, should be departmentalized in the Ministry of Mines? On the face of it, it is passing strange and it is peculiarly British; yet up to the present the arrangement has worked tolerably well, and it will, we think, be generally agreed that the keen competition between gas and electricity has benefited each industry and also the consumer. The problem is, of course, whether the existing plan of three separate entities is fitted to meet the needs of to-day and the immediate future from the standpoint of national economics.

At this month's meeting of the Fuel Luncheon Club, Sir William Larke said that the relative advantage of the use and application of any particular fuel to any particular purpose must be determined on economic grounds. And this, he went on, points to the necessity of a national fuel policy, based not on statutory authority, but on constructive co-operation between the several interests and industries concerned, which "would ensure that each was applied to the service for which it was most suited, having regard to local conditions, availability, and efficiency in its application. This would be greatly facilitated if the whole of the legislative interests concerned with fuel and power were concentrated in one of the great Departments of State instead of being distributed between three, as they are at present." The same view is strongly held by Mr. O. W. Roskill, who acknowledges in his Paper the use of material prepared by the Coal, Gas, and Electricity Committees of the P.E.P., the organization engaged in the study of political and economic planning, whose suggestions regarding the reorganization of the coal industry were given prominence in the National Press last week. On later pages to-day is an abstract of Mr. Roskill's Paper to the Institute of Fuel in which he sets out his personal suggestions for the co-ordination of national fuel and power supplies, dealing in turn with the three industries of coal, gas, and electricity. The Paper is a concise and extraordinarily well reasoned argument for the co-ordination of our fuel industries, and the proposals he makes are neatly and clearly stated. Sir Philip Dawson took the chair at the meeting of the Institute of Fuel, and promised that the Government Ministers concerned with the matter should receive a copy of the Paper and that he would endeavour to ensure that they read it—which, of course, is another thing altogether.

Proposed Ministry of Fuel

For the establishment of what Mr. Roskill demands—a Ministry of Fuel to cover the three industries and be responsible for oil policy—a tightening-up of the internal organization of each industry would be necessary, and of the three there is ample evidence that the coal industry has the weakest organization. In answer to the threat of a coal strike the public, sympathetic to the miners' claims, is paying the price of a truce so that the coal industry may have yet another opportunity of organizing nationally for efficiency, of co-ordinating all the coal mines in this country. In this regard, the proposals of the P.E.P., already mentioned, are set out in a report just published and obtainable from the organization at 16, Queen Anne's Gate, London, S.W. 1, for the sum of 7s. 6d. However, we are concerned here with Mr. Roskill's suggestions relating to the internal organization of the gas and electricity industries with a view to the avoidance of wasteful competition. In the first place the Author asks for the organization of the Gas Industry on a regional basis, in which direction, of course, our Industry has gone a certain way. This implies the breaking down of jealousies between different areas, the surmounting of the parochial spirit. To effect this, he observes, compulsory powers may be necessary. Discussing the present trend towards grouping of undertakings in holding companies, Mr. Roskill suggests that an impartial view would probably concede that holding companies have done substantial good, but that "their growth requires to be watched carefully and powers obtained to check any tendency in the wrong direction." What he means by the "wrong direction" is clear from his Paper. But, he remarks, development by holding companies has been severely limited by the existence of

municipal undertakings, particularly in the North, and this raises the whole question of municipal ownership. The trend seems to be against the running of technical services by municipal committees. "This does not mean a change from municipal control to private enterprise, but . . . private enterprise may have to go together in the organization of regional gas boards."

Mr. Roskill suggests the creation by the electricity industry of a Central Development Authority complementary to the Central Electricity Board and the Commissioners, to stimulate such activities as finance, publicity, and propaganda, testing of equipment, prices of appliances, economic research and statistics; and also the setting-up of a Central Development Authority by the Gas Industry to "promote the possibility of co-ordination between the two central organizations." But a national fuel policy, he maintains—and this is the crux of his Paper—must start with co-ordination at the Government end, and a Ministry of Fuel is needed to take over the activities of the Mines Department relating to coal, the Ministry of Transport relating to electricity, and the Board of Trade relating to gas (as well as the Government policy relating to oil).

Practical Difficulties

THE discussion on the Paper cannot be said to have advanced the matter a great deal. Professor Lander remarked that to have an all-embracing Ministry of Fuel "might be going too far," and that the present anomalous arrangement does not preclude a measure of co-ordination; Sir Philip Dawson pointed to the difficulties confronting the formation of such a Ministry, but he sees no reason why gas and electricity undertakings should not be brought under one management; Mr. Gordon, of the C.U.C., welcomed the idea personally and quite unofficially—and that was all. For the rest the discussion centred on details in the Paper, ignoring the main issue. For our part, from a scientific and logical point of view there is nothing to be said against the establishment of a Ministry of Fuel, provided that the co-ordination of the various sources of energy does not, through lack of competition, lessen development work in new fields and processes in any of the industries concerned. The practical difficulties and complications are, however, many. In the first place it must be borne in mind that the political machine is not exactly "straightforward," and that the Gas Industry, compared with either the coal industry or the electrical industry, has negligible political influence and "pull." The present day mind, both political and "official," seems so heavily weighted on the side of electricity, and to an extent that we know is entirely unsound in every way, that we in the Gas Industry could not avoid a fear that the nation would be deprived in some degree of our potential services. On the other hand, a national fuel scheme, if worked on lines anywhere nearly approaching ideal, would obviously bring us much of the recognition which misses us in present circumstances. Which all leads to consideration of the fact that a Minister of Fuel would have to be given enormous power which would entail correspondingly enormous responsibilities, and it is difficult for us to visualize a succession of impartial, high-minded, and ultra-capable and wise ministers concerned solely with the welfare of the three industries embodied in the scheme and not in the slightest bit influenced by the popular vote. There are certain forms of Government, for instance, known to favour unduly a particular type of energy. A Minister of Fuel, therefore, must be stronger than Government policy if he is to maintain a just balance between competing industries.

This leads us to refer to Herr Hitler's recently announced new laws covering the economics of utility energy distribution in Germany, to be used to prevent damaging developments due to competition between electricity and gas. The laws are designed to invest the Minister of Commerce with almost unlimited power to control all public utilities and to order one or another to take over a certain class of business, and adjust prices. And if public utility leaders do not see eye-to-eye with the Minister—well, according to the German scheme, there is always the alternative of fine or imprisonment. It may be argued with justification that the differences between the British Constitutional Government and the Dictatorships of Germany, Italy, and Russia invalidate comparison. At the same time not a little thought of the probable and possible consequences attending the appointment of a Minister of Fuel in our own country to bring harmony out of discord is desirable. In the meantime, let us get on with the good work of better internal organization as a public utility.

A Strange Comparison

ON Tuesday of last week Mr. A. H. Barker, the Consulting Heating Engineer, presented a Paper to the Institution of Civil Engineers entitled "A General Comparison of Gas and Electricity for Heat Production." It is a lengthy document, and at the meeting the Author presented it briefly and a full discussion followed, which, to our mind, left things very much as they are, but not as they are interpreted by Mr. Barker. Speaker after speaker—and they came from the opposing—or shall we say friendly?—camps of gas and electricity—expressed bewilderment at many of the figures given in the Paper and at the conclusions based on them.

On later pages will be found an extract from Mr. Barker's contribution from which a fair idea may be gained of the method of approach to the subject and the line of argument adopted; and, as coming from an eminent heating engineer, it will cause our readers some surprise. Whether or not the discussion was wholly worthy of a meeting of the Institution of Civil Engineers is, we think, open to question; and as for the Paper, we are in hearty agreement with Mr. Stephen Lacey, who, while not wishing to appear ungrateful to the Author, mentioned that the acceptance of a Paper by the Institution of Civil Engineers gave it a currency and an air of authority which might or might not be justified—of special importance when, as in the present instance, technical and commercial considerations are necessarily closely associated.

Let it be said at once that our Industry views with the gravest concern every single accident resulting from the use of gas and has done, and continues to do, all possible to eliminate any risk in its use. And we think it will be generally agreed that, considering the millions of people served so unfailingly by gas, the accidents which do occur are very rare. To gain a reasonable perspective on the matter it may be mentioned that nine times as many people meet their death each year by accidentally falling downstairs or elsewhere in the house than by accident due to gas or electricity. The truth is, as was stressed by Mr. Lacey, that the use of either gas or electricity is remarkably safe, and such accidents as do occur are generally due to badly designed or improperly installed appliances, which both industries are doing their best to stop. Yet, throughout his Paper, Mr. Barker constantly refers to the danger aspect of the use of gas and electricity and does show a grievous lack of proper perspective.

Against the Facts

AGAIN, the Author explains that the use of gas gives rise, along with heat, to the emission of products of combustion which are mainly of a deleterious character. As a general statement this is quite untrue. The products of combustion of gas are almost entirely carbon dioxide and water, and Mr. Barker must be aware that millions of people are using gas for lighting and cooking—and incidentally for heating—in their homes in appliances without flues. The suggestion that the use of these appliances is deleterious is wholly unwarranted. In this connection we would call the Author's attention to the Interim Report of the Medical Advisory Committee appointed with the approval of the President of the Royal College of Physicians to consider the whole question of the use of flueless gas appliances from a health aspect. This Report, which appeared in the *British Medical Journal* for Aug. 10 last, was published in the "JOURNAL" for Aug. 10, It shows that, with correct gas rate, flueless gas appliances can be employed with absolute safety. One of the findings of the Committee was that "Any form of heating in small unventilated rooms which tends to lead to accumulations of hot stagnant air is objectionable. In this respect flueless gas heaters are no better and no worse than alternative appliances." The Author refers to the use of instantaneous gas water heaters as involving considerable risk of accident—here again a statement which can in no way be reconciled with the many tens of thousands of these appliances in daily use.

"Shrinkage"

MR. BARKER makes repeated references to an imaginary low efficiency of gas appliances variously attributed to heat losses in the flue, inadequate insulation, ventilation of the room, and other causes. Criticizing this aspect of the Paper, Mr. C. A. Masterman rightly disagreed with the assumption on the part of the Author that he sets out equivalent service conditions. For example, if Mr. Barker is content with stuffy room conditions due to inadequate ventilation, then gas comparisons must be based on flueless electric heaters against flueless gas heaters; and as for the tables derived from the air heating effect of a gas fire, the basis of calculation is misleading and false in principle. When we turn to cooking, we find this statement, and we think we have come across it before: "The wastage of weight in the food cooked in an electric cooker is less than in a gas oven, on account of the removal of the vapours by the products of combustion in the latter case." The fact is that designers of electric cookers now appreciate the need for venting the oven in the interests of good cooking, and with modern cookers for equivalent cooking service the loss of foodstuffs being cooked shows no substantial difference whether gas or electricity is used. For cooking, Mr. Barker estimates that electricity at 0·7d. per unit is equivalent to gas at 10d. a therm. This, maintained Mr. Masterman, whose wide experience of the subject makes him particularly well qualified to talk authoritatively, is approximately 50% in error; and he suggested that the Author has not made himself familiar with the developments in gas cooking during the last few years or has exaggerated to this degree what he imagines to be the developments in electric cookers.

The Paper is of a type unusual to the Institution of Civil Engineers, and for this reason we are glad that in the discusion attention was drawn to the undue number of apparent inaccuracies. Communications presented to and discussed by the Institution of Civils necessarily command respect, but we feel sure that Mr. Barker's Paper will not be regarded as a final yardstick for comparing the relative merits and economics of gas and electricity for heat production.

Heat Resisting Glassware

AT this month's meeting of the Illuminating Engineering Society two Papers were given which are of importance to the Gas Industry as a large user of glassware which has to withstand heat, and which should further co-operation, already in being, between manufacturers and users of heat resisting glass. Mr. S. F. Dunkley, Officer-in-Charge of Stores Testing of the Gas Light and Coke Company, whose work on flexible standardization to benefit user and maker alike has been the subject of several references in the "JOURNAL" lately, was responsible for one with special regard to tests for quality; while he and Mr. W. R. Stevens, of the Research Laboratories of the General Electric Company, Ltd., were the authors of the other, which related to thermal tests. It is a sign of enlightenment that two competitive industries should collaborate in the solution of a common problem.

The substantial extract from Mr. Dunkley's Paper which appears on later pages should create a wider interest in the subject in calling attention to the very great advance which has been made by British manufacturers in the quality of heat-resisting glass and to the economies which can be effected by its more general adoption. Naturally the importance of the subject will be more particularly realized by those undertakings responsible for the maintenance of large lighting installations and which presumably have costs and statistics of replacements available. As an instance of what the problem implies, it may be mentioned that last year the Gas Light and Coke Company issued over a quarter of a million items of glassware for a very wide range of types and sizes of units and conditions of use—and this figure is possibly only a small proportion of the actual number sold on its area. And in regard to these conditions of use, they vary so much that only the highest quality heat-resisting globes can be expected to withstand the more severe conditions of either indoor and outdoor use. Therefore, Mr. Dunkley reasonably argues that from the point of view of economy in initial installation and subsequent maintenance the quality of the glassware should be matched to the conditions likely to be met.

Quality and Economy

IN the past little encouragement was given to the British manufacturers owing to the general acceptance of cheap foreign glassware and the fact that insufficient data were given to them as to the requirements of use. There has been scant appreciation of the savings to be effected in maintenance by paying a higher price for the right materials. The difference in the cost between first quality, second quality, and indifferent heat resisting glass, stated the Author in introducing his Paper to the meeting, is in the ratio of 100:75:50, and from statistics available this difference in first cost could be very quickly saved in maintenance costs, at the same time obviating a considerable amount of inconvenience. With modern first quality heat-resisting glass very few failures are experienced other than occasional defects due to discoloration at spots where the highest temperatures are experienced; and British glass manufacturers are to be congratulated on their recent achievements which have resulted in the regaining from abroad of much of this trade. As an example of the type of development made, Mr. Dunkley quotes the experience of the Gas Light and Coke Company of the huge sign over Watson House—a sign

well known to many of our readers and familiar to the many thousands in the vicinity of Nine Elms. Brought into lighting six years ago, the severe atmospheric conditions were such that breakages of glassware and consequently breakage of mantles were very high and resulted in heavy maintenance costs and also poor appearance of the sign. In 1930, a leading manufacturer, after much experiment, produced a globe of outstanding thermal endurance, and since adoption of this type of glass no case of breakage has occurred while the lamps have been in use.

There is need for still closer co-operation between manufacturer and user with a view to making it easier for either to distinguish between satisfactory, indifferent, and poor heat-resisting glass. In this connection Mr. Dunkley devotes a large part of his Paper to discussion of the manner of test desirable. The two properties for test are wearability and thermal endurance, and no national specification, so far as we are aware, provides for both. In regard to thermal endurance, the test clause of the B.S. Specification of 1927 was, as a result of discussion and experimental work on the part of the manufacturers and the research laboratories of the Gas Light and Coke Company and the General Electric Company, modified in 1934; but Mr. Dunkley maintains that the national test as it exists at present, though developed to cover possibly the largest category of use, does not go far enough. It does not cater for extreme conditions. The Author's constructive suggestion is that an effort should be made to classify glassware under three headings —one quality for the most extreme conditions, another quality for normal conditions, and a third for decorative illumination. Mr. Dunkley follows up his suggestion by submitting three forms of test which, he believes, " would immediately enable manufacturers and users to classify glassware and lighting units and relate them to temperature and conditions of use, and therefore prevent difficult disputes as to failures of glass in use." His suggestion, we feel sure, will not be shelved. It calls for further co-operation between maker and user, with a view to these or similar tests being included in a national specification.

Difficulties of Degree

That the path of the gas administrator is no longer the straight and easy one which it was years ago is well understood by all who are in close touch with the Industry; those not so situated will realize it from a study of the addresses delivered by chairmen at this month's annual gas company meetings. In the main, the problems are the same for all, the difference being one of degree, governed by particular circumstances as applying to individual undertakings. In the case of the Commercial Gas Company (the proceedings at whose meeting are reported fully in this issue of the " Journal "), the circumstances are peculiar, and such as to aggravate those problems which apply in variable degree to the Industry as a whole. One respect in which the Commercial Company labour under peculiar disability is that they are absolutely restricted in the matter of area. As was pointed out by the Chairman, Dr. Charles Carpenter, whereas in other cases assistance might be afforded by extensions, this Company have for many years had no such possibility. Thus the Company have nothing to help them over these difficulties of degree. Nothing, that is to say, but their own efforts.

In these efforts there is plenty of hope for the future, and shareholders will derive considerable encouragement from what the Chairman had to say last week. It is true that on the present occasion the proprietors are receiving a final dividend of only 2½%. In other words, they are being paid for nothing more than the use of their money —which payment has been settled by Act of Parliament at 5% per annum. They are getting no return for skill in management, to which, as Dr. Carpenter declared, they are certainly entitled by the efforts of the officials and employees. This is the first time, too, since the introduction of the original profit-sharing scheme more than thirty years ago that no bonus has been available for distribution among the staff and workmen. These profit-sharing schemes are of incalculable benefit to both parties to the bargain, but they must from their very nature be open to the drawback that the time of greatest divisible bonus —that is, the time of greatest prosperity—need not, and most frequently does not, coincide with the period of hardest work and greatest strain. As that is a condition which cannot be avoided, it must be faced, and we feel sure it will be faced in the manner anticipated by the Directors of the Company, who are confident that the co-partners will not be disheartened by the setback, but rather encouraged to make even greater efforts to maintain, or if possible even to extend, the Company's interests and service to the public.

There being, in the case of the Commercial Company, no virgin soil to exploit, these redoubled efforts must be directed very largely to an increased consumption per consumer, so that no possible new use for gas should be neglected. During the past year large numbers of additional appliances were supplied, and these must have been chiefly to existing consumers. A gratifying feature of the report is an increase of nearly 13%, as compared with the previous year, in the gas used for trade purposes, and it is to be noted that the Directors have every hope of a further expansion of this load. Such gas has, of course, to be supplied on a lower tariff, and an important concession has also been made to the prepayment consumers, who are to be charged nothing at all beyond the standard gas rate on quantities taken in excess of the first 15 therms consumed in each collection period of six weeks. For these 15 therms the additional charge is 3d. per therm, as compared with the 2d. previously charged. The effect of both these factors, however, should be to increase the consumption of gas to such an extent as will more than off-set the reductions in price. With all these things in mind, it is not hard to catch a glimpse of the " silver lining contained behind the dark cloud of the Directors' report," and one may hope with the Chairman that at the end of this year there will be a better story to tell than there has been at the beginning.

Lighting and Cooking

Competition is exceptionally keen for the Commercial Gas Company, because there are three municipal electricity undertakings supplying current within their area, and, not being permitted to go outside their own boundaries, they must secure additional output largely by the displacement of gas. This competition reveals itself in divers ways. For example, while there is, proportionately speaking, more slum clearance and building of working-class tenements in East London than in other parts of London, " it is not possible," Dr. Carpenter told his shareholders, " owing to the unfair restrictions put in our way regarding the gas lighting of the new buildings, to secure the amount of business which we formerly had from tenants of the houses demolished." Dr. Carpenter has always been a staunch supporter of the gas lighting load, and this support is based upon his own personal experience, which is to the effect that the incandescent mantle provides what is, " without exception, still the best light for working by." At the Commercial meeting he produced very interesting evidence that the lighting

load, in spite of the large amount of electricity that is used, is still a very important one to the Company. During the dark days just before last Christmas, the consumption of gas went up very considerably—not as a result of lower temperature, but because the sky was overcast, and the many thousands of consumers who had gas lights put them into use.

With regard to cookers, black models are rapidly being displaced, upon realization of the increasing importance of supplying the public not only with something that is useful, but with something that has a good appearance as well. Nearly one-half the cookers have been exchanged in this way, and the work of dealing with the remainder is being rapidly proceeded with. Meanwhile, great efforts are being made by the electricians to secure some sort of cooking load, and, indeed, it seems that quite a number of electric cookers have already been installed. As Dr. Carpenter said, "to the regret of many of the users; and it is only the liability of having to pay for the cost of fixing that prevents their removal."

Personal

To mark his departure to take up his duties at Kelso, Mr. JOHN G. CUTHBERT, formerly Assistant Manager at Airdrie, where he has been for the past eleven years, was on Feb. 20 presented with a mark of esteem by his colleagues in the municipal service. The presentation was made by Mr. Archibald Kellock, Engineer and Manager, and Councillor J. Campbell MacGregor, Convener of the Gas Committee, presided.

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Owing to ill-health Sir WILLIAM RAY, M.P., has resigned his position as Executive Chairman of the British Electrical Development Association. Sir William Ray was appointed to his position with the Association in 1933. He led the Municipal Reform Party in the London County Council from 1925 to 1934, when he retired. He has represented Richmond in the House of Commons since 1932. He was knighted in 1929.

Obituary

The death took place last week of Mr. EDWIN HOLMES, at Russell House, Shifnal, in his 92nd year. For very many years he was Chairman of the Directors of the Shifnal Gas Company, and occupied that position at the time of his death.

New British Standard for Copper Tubes

Prepared by Representative Committee

The advantages of copper tubing for domestic engineering have long been appreciated, principal among which are its resistance to corrosion, the facility with which it may be installed, combined with neat appearance, its strength and elasticity, and its low co-efficient of friction to the flow of water. It was originally the practice for such tubing to be used with screwed fittings, but a greatly increasing use is now being made of light-gauge copper tubing, such as is joined by means of compression joints, capillary joints, or bronze welding. Such tubing, while being of adequate strength, is cheaper than the heavier screwed tubing, and at present may be installed at an initial cost which compares favourably with installations using pipes of iron or lead. The tubing may be used equally satisfactorily for water or for gas.

Naturally, as the amount of material in these light tubes is relatively less, the question of quality is of prime importance. Moreover, the nature of some fittings used with it demands that the dimensions are uniform within close limits.

A new British Standard Specification for this type of tubing has been issued. The specification, as in the case of all British Standards, has been prepared by a fully representative committee of manufacturers and users. It provides for a range of sizes of tubes from $\frac{1}{8}$ in. to 4 in. nominal bore, suitable for working water pressures up to 350 ft. head. It standardizes the chemical composition of the material, and lays down simple mechanical tests for proving the ductility of the tubes. The outside diameters and thicknesses are standardized, and permissible tolerances on these dimensions are specified.

Copies of this new specification, No. 659-1936, may be obtained from the Publications Department of the British Standards Institution, 28, Victoria Street, London, S.W. 1, price 2s. 2d. post free.

Correspondence

Appeal for Mrs. Maurice Drohan (Cavan)

SIR,—I might usefully inform those contemplating contributing to the Fund for the assistance of Mrs. Maurice Drohan (Cavan), that she is not eligible, under the rules, for a grant from the Benevolent Fund of The Institution of Gas Engineers, since her late husband was not a member of the Institution.

The Appeal for her assistance has the approval of the Committee of Management of the Benevolent Fund.

Yours, &c.,
J. R. W. ALEXANDER,
Honorary Secretary,
The Benevolent Fund, I.G.E.

28, *Grosvenor Gardens,*
Westminster, S.W. 1.
Feb. 18, 1936.

Forthcoming Engagements

Feb.

25-27.—JOINT GAS CONFERENCE.—B.I.F., Birmingham.
28.—I.G.E.—Joint Research Committee at 2.30 p.m.

Mar.

2.—WOMEN'S GAS COUNCIL.—Executive Committee at 11.30 a.m.
3.—I.G.E.—Research Executive Committee, 2.30 p.m.
4.—MANCHESTER AND YORKSHIRE JOINT JUNIOR ASSOCIATIONS.—Visit to Leyland. Paper by Mr. R. L. Greaves.
4.—SOUTHERN ASSOCIATION (EASTERN DISTRICT).—Meeting at 28, Grosvenor Gardens, S.W. 1, at 2.30 p.m.
5.—B.C.G.A.—South Wales District Conference at Cardiff.
5.—MIDLAND JUNIOR ASSOCIATION.—Meeting. Lecture on Refrigeration.
7.—SCOTTISH JUNIOR ASSOCIATION.—Joint Meeting in Edinburgh. Paper by Mr. H. Kerr.
9.—I.G.E.—Finance Committee, 1.45 p.m.; Membership Committee, 2.15 p.m.; Council Meeting, 3 p.m.; General Purposes Committee, 5 p.m.
10.—I.G.E.—Council Meeting, 10 a.m. (resumed).
11.—I.G.E.—Board of Examiners, 10.30 a.m.
12.—B.C.G.A.—Annual Meeting of Members in the Southern District, 28, Grosvenor Gardens, S.W. 1.
12.—MIDLAND ASSOCIATION.—Annual General Meeting, Grand Hotel, Birmingham, 2.30 p.m.
13.—MANCHESTER ASSOCIATION.—Annual Meeting and Luncheon, Midland Hotel, Manchester.
13.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. General Discussion. Evening.
14.—SCOTTISH WESTERN JUNIOR ASSOCIATION.—Annual Business Meeting. Address by Mr. D. Fulton.
15.—WALES AND MONMOUTHSHIRE JUNIOR ASSOCIATION.—Meeting at Swansea. Paper by Mr. D. E. Wilkins.
17.—I.G.E.—Education Executive Committee, 2.30 p.m.
19.—I.G.E.—Refractory Materials Joint Committee, 2.30 p.m.
21.—SCOTTISH WESTERN JUNIOR ASSOCIATION.—Meeting at Bonnybridge.
21.—WESTERN JUNIOR ASSOCIATION.—Meeting at Cheltenham. Paper by Mr. J. H. Smith.

News in Brief

The Tender of Messrs. Humphreys & Glasgow, Ltd., London, for the reconstruction of water gas plant (announced in the "JOURNAL" for Feb. 12) has been accepted by the Belfast Gas Committee.

Cookery Demonstrations were given by Miss R. M. Thring, M.C.D.S., of the Radiation research kitchen, in conjunction with the Burton-on-Trent Gas Department, at Burton last week. The demonstrations were very well attended.

The Manchester District Association of Gas Engineers are holding their Annual Meeting at the Midland Hotel, Manchester, on Friday, March 13, when Mr. A. L. Holton will deliver his Presidential Address. Prior to the meeting the Annual Luncheon will take place.

The Midland Association of Gas Engineers and Managers meet at the Grand Hotel, Birmingham, for their Annual General Meeting on March 12, when Col. G. S. Eunson will deliver his Presidential Address. A private luncheon will take place prior to the meeting.

Sir Francis Goodenough was the principal guest and speaker at the Annual Dinner of the Hull and District Branch of the Chartered Institute of Secretaries on Saturday, Feb. 22, and Mr. Rhodes Armitage and other Officials of the British Gas Light Company, Hull, were also present.

"**Gas and Its Uses,**" a talk given over the microphone by Mr. H. Stafford Hatfield, is reprinted in *The Listener*, the publication of the B.B.C., for Feb. 19. The talk had special regard to the wide variety of products in the manufacture of which the first step is the carbonization of coal.

The Fourteenth Annual Corporate Meeting of the Institution of Chemical Engineers will be held at the Hotel Victoria, Northumberland Avenue, W.C. 2, on Friday, March 6. Owing to the death of His Majesty King George V, it has been decided to postpone the Annual Dinner from March 6 to a date to be announced later.

The Severn Valley Gas Corporation announce that they have placed through their brokers, Messrs. Panmure, Gordon, & Co., £135,000 of 4½% cumulative preference shares of £1 each at a price of 21s. 9d. per share. This brings the issued share capital of the Corporation up to a total of £910,208, made up as follows: £454,510 of 4½% cumulative preference shares of £1 each, £355,698 £1 ordinary shares, and 100,000 deferred shares of £1 each. The Corporation has a total authorized capital of £1,500,000.

Contracts for Mainlaying recently let by the Swindon United Gas Company involve 18 miles of steel mains from Swindon to Highworth (6 miles) and Faringdon, Berkshire (12 miles). The total estimated cost of this work is £10,000. The contract for the supply and erection of high-pressure boosting machinery has been let to Messrs. W. C. Holmes & Co., Huddersfield, and that for the supply of steel mains to Messrs. Stewarts & Lloyds, Ltd. The work is expected to take four months to complete, when the manufacturing plants at Highworth and Faringdon will be dismantled.

The Growing Popularity of the Coke Fire was mentioned by Mr. Lawrence G. Williams, Chairman of the Cardiff Gas Light and Coke Company, in the course of his address to the shareholders of the Company at the annual ordinary meeting on Feb. 20. "We have devoted a great deal of money and endeavour to producing coke of uniform quality and size, which is thoroughly suitable for domestic use," he said. "We desire to develop to the fullest extent possible the combined use of the two fuels we manufacture and to supply them to the public at the maximum of advantage to the consumers and to the Company."

The Fourth Lecture of the Season arranged for the outdoor staff of the Sheffield Gas Company was held on Feb. 21. Mr. John F. Colquhoun (Public Lighting Engineer of the City) gave a lecture on "Street Lighting," with particular reference to the British Standard Specification and the Interim Report of the Departmental Committee on Street Lighting. Mr. Colquhoun explained by practical demonstration and a selection of lantern slides the various forms of street lighting, methods of testing illumination, and also the effect of speed on vision. The laboratories and workshops of the City of Sheffield Lighting Department were also visited during the evening.

The New Showrooms of the Dundee Gas Department, situated in Commercial Street, will be opened next month, and arrangements have been made for an inauguration ceremony.

An Order has been placed by the Sunderland Gas Company with Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees, for a new four-lift spiral-guided gasholder, capacity 560,000 cu.ft.

The Chief Speakers at a Conference on Profit-sharing and Co-partnership arranged by the Industrial Co-partnership Association, held on the afternoon of Wednesday, Feb. 19, by invitation of Bryant & May, Ltd., at the Fairfield Works, Bow, were Sir Montague Barlow, a former Minister of Labour, and Mr. Herbert G. Tanner, a Managing Director of E. S. & A. Robinson, Ltd. In the early part of the afternoon visitors were shown round the match works. Mr. Clarence E. Bartholomew, Chairman and Managing Director of Bryant & May, Ltd., took the Chair, following tea, and Mr. F. W. Raffety, Chairman of the Industrial Co-partnership Association, replied to the discussion.

Debenture Stock to the value of £49,000 is to be issued under the authority of the Plymouth and Stonehouse Gas Order, 1930. Permission was given to the Directors of the Company to do this at an extraordinary meeting of the Proprietors held last week, when it was explained by Col. R. L. Norrington, Chairman of Directors, that the stock was the only portion remaining unissued of the additional capital authorized by the 1930 Order. The money was needed for financial extensions to mains in various outlying districts in the Company's area for the provision of modern all-enamel cookers to replace cookers of older types, and for the general purposes of the Company's business.

A Scheme for the establishment of a central stores, the re-arrangement of workshops, and certain other alterations has been submitted to the Bury Gas Committee by the Commercial Manager of the Gas Undertaking. The Committee has decided that consideration of the gas tariffs be deferred for the time being, except that the charge of 2s. per 1,000 cu.ft. adopted by the Committee in June last for gas used by water heaters in domestic hot water systems be applied to all water heaters, except those installed in greenhouses and garages, for the period until such time as the Borough Treasurer and Commercial Manager have obtained sufficient data to report further on the matter of charges to the Sub-Committee.

A Serious Electricity Breakdown occurred at Bradford early on Monday evening, depriving over 300,000 inhabitants of current as a result of an explosion at the Corporation electricity works in Valley Road following a fault in the switch governing the whole city's power and lighting supply. Trams and trolley buses were brought to a standstill; night shift workers at several mills had to return home; while the City's morning newspaper had to transfer its staff to Leeds so that printing could be carried on there. A play at the Princes Theatre was given by candle light, and cinemas had to cancel their programmes. Another electricity failure affected several districts of Surrey on Monday as a result of workmen coming in contact with a 10,000 volt supply. Fortunately, the men escaped with nothing more serious than burns, but the breakdown extended from Weybridge to Esher, and much confusion was caused.

Amalgamation and Grouping

Pittenweem and St. Andrews.

At a general meeting on Feb. 19 of the Pittenweem Gas Light Company it was unanimously decided to amalgamate with St. Andrews Gas Company, Ltd. Mr. Andrew Todd, Chairman of the Company, presided and moved the resolution to amalgamate, after Mr. John Cargill Cantley, of the St. Andrews Gas Company, had addressed the meeting, explaining various points and intimating that cheaper gas would ultimately be available for Pittenweem.

Severn Valley and Much Wenlock.

The Much Wenlock Borough Council on Wednesday, Feb. 19, approved the purchase of the Gas Undertaking at Much Wenlock and the Severn Valley Gas Corporation.

The British Commercial Gas Association

Northern District Conference at Middlesbrough

The Northern District Conference of the B.C.G.A. was held in the Council Chamber, Municipal Buildings, Middlesbrough, on Thursday, Feb. 20, under the Presidency of Alderman S. A. Sadler, J.P., Chairman of the Middlesbrough Corporation Gas and Electricity Committee.

The delegates were welcomed by the Mayor of Middlesbrough, Councillor Arthur Elstrop, J.P. Then followed the opening Address by the President of the Conference. "The Gas Industry" was the subject of an Address by Alderman Louis F. W. S. Smith, J.P., who pointed out that whatever might be the respective opinions on the relative merits of gas and electricity, there must be absolute unanimity that health, comfort, and character were among the greatest assets of a nation. It would also be agreed that the chief contributory factors to these assets were decent housing conditions, good cooking, and a clean atmosphere. With all this the Gas Industry was vitally affected. The slum question had caused a great upheaval in the country, not least in the north, particularly in the great industrial areas. The Government had acted none too soon. People had been merely existing—in the most degrading conditions. The vital statistics had told their true tale. New estates were springing up all over the country to meet the accommodation necessitated by the wholesale demolition of slum dwellings. The disturbance considerably concerned the great public utility undertakings and involved heavy capital charges on them. Gas, water, and in some instances electricity had been provided for in old property and the demolition and scrapping of those services with the consequent new installations meant much expenditure.

Labour-saving devices were called for on humanitarian as well as on economic and time saving grounds. Architects, therefore, were directing their studies and houses were being erected to the end of reducing housework to a minimum. And there had been a call for the production and installation of labour-saving devices. Magnificently had the Gas Industry responded to these demands. Investigation, experiment, and ingenuity had produced their due reward. The operating efficiency of gas cookers, gas fires, gas radiators, and gas water heaters had been very much improved during recent years. Their ability had not been the only consideration. Special attention had been given to both design and appearance, with results so pleasing and varied that they were being constructed suitable to any type of home and any scheme of decoration.

Ventilation and an even temperature were the necessities of good health and comfort. These could be produced by a gas radiator in the hall and a gas fire in every bedroom and sitting room. Unlike the dry enervating heat of another commodity, gas maintained the proper temperature, ensuring ventilation without a too static dryness. Were not the natural heat and light of day produced by the incandescent gases of the sun?

The discussion on Alderman Smith's Address over and a vote of thanks proposed and duly seconded, the delegates were entertained at luncheon in the Town Hall by kind invitation of the Chairman and members of the Middlesbrough Gas and Electricity Committee. In the afternoon a visit was paid to the Tees (Newport) Bridge.

At the Women's Session held the same afternoon in the Council Chamber of the Municipal Buildings, under the Presidency of the Mayoress of Middlesbrough, Mrs. Arthur Elstrop, Mrs. Eileen Murphy delivered an Address entitled "Men, Women, and Gas," in the course of which she said that she did not think there was ever before such interest in good cooking as there was to-day. It was all the more striking because so many women nowadays worked in offices before they got married. They had not the chance of learning cookery at home, so the bride of to-day went to night schools to learn. The modern style of gas cooker, with its perfect control of heat and its immense saving of time and work, was the main reason for the revival of interest in good home cooking. Modern gas lighting gave six times more light than the old type of gas lighting, and yet it was cheaper than ever. It could be switched on or off as easily as any other kind of lighting. Its biggest advantage was its effect on the eyes. Of all artificial lights, gas was the nearest to daylight. The yellow and red rays in the gas flame were actually a tonic to the eyes and helped to prevent eye strain and wrinkles. Further, gas lighting showed colours truthfully. It did not distort them. That was why painters, when they had to work at night, used gaslight.

A lively discussion followed the delivery of the Address, at the conclusion of which tea was served in the Mayor's parlour.

Third World Power Conference

British Papers

As already announced in the "JOURNAL," the Third World Power Conference is to be held in Washington between Sept. 7 and 12.

The Executive of the British National Committee have appointed the following Fuel Papers Committee:

- Dr. C. H. Lander, C.B.E. (Chairman), Vice-Chairman, British National Committee; Professor of Mechanical Engineering, City and Guilds (Engineering) College.
- Sir Harold Hartley, C.B.E., F.R.S. (*ex-officio*), Chairman, British National Committee.
- Dr. A. E. Dunstan, Member, Executive, British National Committee; Representative of the Institution of Petroleum Technologists.
- Colonel J. G. Fleming, C.B.E., D.S.O., Crown Agent for the Colonies.
- Mr. E. J. Fottrell, Representative of the National Gas Council of Great Britain and Ireland.
- Dr. F. S. Sinnatt, C.B., M.B.E., Member, Executive, British National Committee; Director of Fuel Research, D.S.I.R.
- Dr. E. W. Smith, C.B.E., Member, Executive, British National Committee.
- Mr. R. F. Taylor, M.B.E., Representative of the Mines Department.

Arrangements are in course of completion for the preparation of a thoroughly authoritative collection of British Papers.

There will also be a post-Conference transcontinental tour of about three weeks' duration, the cost of which will be remarkably low since—thanks to the generosity of our American hosts—a substantial subsidy will be devoted to reduce what would otherwise be the very considerable expenditure involved.

Intending participants in the Conference are requested to apply as soon as possible for full particulars to the office of the British National Committee of the World Power Conference, 36, Kingsway, London, W.C. 2.

Women's Gas Council

Dunstable.

The Mayor of Dunstable (Alderman A. J. Cooke, J.P.) opened the Home Service Exhibition which the Dunstable Gas and Water Company (Tottenham and District area of supply) held last week at the Dunstable Town Hall.

After the opening ceremony Miss Halpin spoke on the work of the Women's Gas Council and announced that it was proposed to form a branch in Dunstable as soon as sufficient members had been enrolled.

Southend-on-Sea.

The Women's Gas Council held a large meeting at Southend (Gas Light and Coke Company) on Feb. 18, when the Mayoress presided over some four hundred guests who assembled in the Ball Room of the Palace Hotel to hear a talk on "My Ideal Home" by Mrs. Cottington-Taylor, which was illustrated with a completely new set of slides showing the latest gas fires and cookers.

Miss Halpin then addressed the meeting and explained the aims and objects of the Women's Gas Council. The wish was expressed that a branch should be started in this district, and arrangements are now being made for the formation of a local branch.

Mr. R. W. Foot, Manager, of the Gas Light and Coke Company, in proposing a vote of thanks to the speakers, expressed his Company's whole-hearted support of the Women's Gas Council and its work.

Yorkshire Junior Gas Association

Presentation to Mr. J. R. Firth

On Saturday, Feb. 15, the Yorkshire Junior Gas Association held a Short Paper Meeting at Bradford.

Before the Papers were read the President, Mr. J. W. Carlton, presented to Mr. J. R. Firth an oak bureau, subscribed for by the members of the Association, in recognition of his services as Honorary Secretary. The President complimented Mr. Firth on the efficient and enthusiastic service he had rendered to the Association during his Hon. Secretaryship, to which sentiments Mr. R. Halkett, Junr., and Mr. B. Thorpe (Past-Presidents of the Association) readily subscribed.

Mr. Firth replied that he had always regarded his duties as a pleasure and honour, and it was very gratifying to know that his efforts had been so much appreciated.

Royal Sanitary Institute Meets at Bath

Mr. J. Wesley Whimster on the Smoke Nuisance

At a Sessional Meeting of the Royal Sanitary Institute which opened on Friday, Feb. 14, a Paper was delivered by Mr. A. Tyler, Chief Sanitary Inspector of Bath, in the course of which he said: It is obvious, that air being so essential to life, its purity should be such that we should breathe clean air instead of the mixture of air, tar, and soot which many of our town-dwellers have to inhale day after day, but as long as raw coal is burnt indiscriminately in industrial furnaces, and so long as it is used in domestic grates, the pollution of the atmosphere with smoke will continue.

As a constructive policy, Mr. Tyler suggested:

1. The formation of a Regional Smoke Abatement Committee for the West of England on the line of similar committees now in operation in the West Riding, the Greater London area, Sheffield and district, and other areas.

2. That local authorities should undertake to carry out propaganda on smoke abatement; such propaganda not to be confined to adults, but to include lectures in the schools.

3. Consideration of ways and means to bring the price of low-temperature carbonization fuel down to such a level that even the poorer classes could afford to buy it.

"If by our combined efforts the atmosphere is made cleaner," said Mr. Tyler, "we shall have done something to make the world better to live in. Let us leave no stone unturned in our endeavour to banish smoke from the sky."

In the course of the discussion which ensued, Mr. J. Wesley Whimster, Engineer and Manager to the Bath Gas Company, stated that he had been interested for a good many years in this problem of smoke prevention, not only with regard to the industrial smoke problem, but also with domestic smoke. He agreed with Mr. Tyler that the domestic smoke problem was by far the greater evil. Mr. Whimster claimed that the Gas Industry was doing an enormous amount to reduce the domestic smoke evil, but there was a great deal more to be done among the householders of this country.

Commenting on various points in Mr. Tyler's Paper, Mr. Whimster referred to the use of Coalite as a substitute for coal. He agreed with Mr. Tyler that the higher price of this product made its use as a coal substitute an uneconomic proposition. It had been on the market for twenty years, but had made no headway. Otherwise it would have been more extensively manufactured, for the process only involved carbonization at a lower temperature than was usual in gas-works.

The number of houses in Bath, added Mr. Whimster, was probably between 25,000 and 26,000. There were in the City some 25,000 gas cookers and 70,000 gas fires.

Commenting on the problematical disuse of coal in the interests of smoke prevention, Mr. Whimster remarked that some 70,000 or 80,000 tons of coal from the Bath district were carbonized each year at the local Gas-Works. In the current week, when the temperature was some 14 degrees less than in the corresponding week of last year, the consumption of gas had increased by 37%. In the few days before last Christmas, when there was a similar cold snap, the increase in local gas consumption was 40%.

Manchester and District Junior Gas Association

Visit to Darwen

Members of the Manchester and District Junior Gas Association visited the works of the Darwen Corporation Gas Department on Feb. 8 under the Presidency of Mr. A. K. Collinge, of Preston. The visitors, numbering over seventy, were welcomed by Alderman G. Pickup, Chairman of the Gas Committee, and by the Gas Engineer and Manager, Mr. T. Haworth, F.C.S., and proceeded to inspect the Darwen Works.

The carbonizing plant, which was installed by Messrs. Drakes, Ltd., of Halifax, in 1932 and inaugurated in October of the following year, consists of four settings of upwardly heated continuous vertical retorts, each setting comprising four retorts in units of two, the chambers being provided with independent gas and air supply with dampers and regulators grouped in most convenient positions, thus permitting of the setting temperatures being easily regulated to suit varying throughputs.

The retorts are 45 in. by 21 in. at the base, tapering to 36 in. by 12 in. at the top, and are 24 ft. 6 in. long overall. Throughout the entire heating zone the retorts are constructed of Meltham toughened Silica material, the combustion chambers and setting linings being of the same material. The producers are arranged on the ground floor in front of the settings, and have a fuel consumption of approximately 11 lb. of coke per 100 lb. of coal carbonized.

Coal is brought into the works by rail and unloaded direct into a covered store running alongside the retort house; this store has a capacity of 3,500 tons. From the store coal is conveyed to the retort hoppers by means of a jigger feed surmounting the coal crusher and a continuous bucket elevator. The hoppers hold 48 hours' supply.

Coke from the extractors is transported in telpher skips to the screening and grading plant, thence passing to storage hoppers which carry five different grades. These hoppers are provided with bottom chutes to facilitate loading direct into road vehicles, while other chutes load into bags.

Ancillary plant includes a waste-heat boiler, an auxiliary producer, the usual condensing, exhausting, and purifying plant, together with tar extractors and ammonia washers. The station meter is of the rotary type, having a capacity of 8,000 to 80,000 cu.ft. per hour. Storage consists of two 4-lift column guided holders each of a capacity of 625,000 cu.ft. There are two station governors, one of 18 in. diameter and one of 24 in., both of the water loaded type. A steam-driven compressor delivers gas at 5-lb. pressure to a governor 1,600 yds. from the works and fed into the low-pressure system when required to meet peak loads.

The steam-raising plant consists of two Lancashire boilers with forced draught furnaces, working at a pressure of 100 lb. per sq. in. The works are complete with laboratory, offices, and workshops.

The total amount of gas made at Darwen during the year 1934-35 was 188 million cu.ft. There are 52 miles of mains supplying 11,285 consumers.

At the conclusion of the tour of inspection, the visitors were entertained at tea by the Gas Committee and Messrs. Drakes, Ltd.

A hearty vote of thanks was accorded to their hosts on the proposition of Mr. J. Albinson (Partington), who paid tribute to the general efficiency of the Darwen works and to the enterprise of the Gas Committee in putting down this new plant. This was seconded by Mr. N. Partington (Oldham).

Alderman Pickup and Mr. Haworth responded on behalf of the Gas Department, while Mr. Thompson, of Drakes, Ltd., congratulated the management and staff on the manner in which they had operated the plant.

Mr. A. L. Holton (President of the Manchester District Association of Gas Engineers), in the course of a few remarks, said that Darwen were the pioneers in this country of the Munich chamber.

A Paper was subsequently read by Mr. J. A. Derbyshire, of Darwen, on the subject of "Carbonization Control;" and a vote of thanks to the speaker was proposed by Mr. H. B. Knowles (Padiham).

Inventor of Slot Meter Honoured

Memorial to Thomas Thorp

"His name will go down to posterity with that long list of non-professional scientists who have done so much to help scientific investigation," said Prof. E. V. Appleton, in opening the Thomas Thorp Memorial Room in the premises of the Manchester Literary and Philosophical Society, George Street, Manchester, on Feb. 11.

He was referring to Mr. Thomas Thorp, of Whitefield, whose inventive genius benefited mankind to such a considerable extent. Mr. Thorp died in 1914, and it was not until nearly two years ago—20 years after his death—that Whitefield itself made the first recognition of his many achievements. At that time a framed photograph of Mr. Thorp was unveiled at the Town Hall. Even then it was one of his lesser achievements which led up to his public recognition. Had the remark not been made by the President of the British Commercial Gas Association that the inventor of the practical slot meter ranked high in the list of those who had rendered service to mankind, Mr. Thorp's numerous other inventions might not have been brought before the public notice. Now, by the initiative of Mr. Thorp's three sons, Manchester has a permanent memorial to him. It takes the form of a small exhibition room or museum, called the Thomas Thorp Memorial Room, in which are exhibited the many pieces of scientific apparatus and MSS. which the Manchester Literary and Philosophical Society has accumulated during its 150 years' existence.

By the generosity of Mr. Franklin, Mr. Clifford, and Mr. Harvey Thorp, this new room has been added in memory of their father, Mr. Thomas Thorp, who was a member of the Society from 1896 until his death in 1914. In the absence of Mr. Franklin Thorp, the room was handed over

to the Society by Mr. Clifford Thorp, and after it had been formally accepted by the President (Mr. R. W. James), it was opened by Prof. E. V. Appleton.

The following excerpts are reproduced from our issue of June 23, 1914, when we announced Mr. Thorp's death:

He had been engaged in scientific research for almost a lifetime; and his inventions, some of which had far-reaching effects upon the scientific as well as the commercial world, were numerous, particularly those relating to gas.

Mr. Thorp was the son of a farmer at Besses-o'-the-Barn, Lancashire. He was educated at the Manchester Grammar School, and was subsequently apprenticed to Messrs. Maycock & Bell, architects and surveyors, of Manchester. While with them he did a great deal of pioneer work in connection with the town planning of New Brighton. Besides buildings of a domestic character, he designed the Prestwich, Whitefield, and Little Hulton Liberal Clubs . . . and various manufacturing works in Lancashire. He was Consulting Engineer to the Whitefield Local Board and later to the District Council for close upon thirty years.

At an early age Mr. Thorp was seriously engaged in scientific research, and was one of the first, if not actually the first, to produce a penny-in-the-slot gas meter. In conjunction with Mr. Marsh, he took out a patent in 1889; and this was followed by others for improvements.

The original meters of this kind put on the market were made at Mr. Thorp's works at Besses-o'-the-Barn, and used in Casino Street, Liverpool. He was also the inventor of the rotary meter for the measuring of gas; and he produced the discount meter—a rotary meter on a small scale. . . . He was the patentee of a large number of inventions relating, among other things, to gas lamps, gas and vapour burners, anti-pulsators, time recorders for gas lamps, pressure recorders, &c. At the time of his death he was engaged in perfecting a cinematograph screen.

He was a Fellow of the Royal Astronomical Society; a member of the British Association, and had served on its Committees; a Vice-President of the North-Western Branch of the Astronomical Society; a member of the Council of the Manchester Literary and Philosophical Society, of which he declined the Presidency. He built an observatory for the purpose of furthering his astronomical researches, and it was here that were manufactured lenses for the most powerful telescopes in the world.

Cornish Gas Association

Annual Meeting

At the Annual Meeting of the Cornish Gas Association held at Truro on Wednesday, Feb. 19, Mr. H. Richards, the Manager and Secretary of the Redruth Gas Company, was elected President for the ensuing year.

Mr. H. H. Hoare, of Falmouth, the retiring Acting-President, in moving the election of Mr. Richards, said that it was fitting that Mr. Richards should occupy the Presidential Chair, as he represented the town in which gas was first produced for lighting in this country, Murdoch having made and used gas for lighting in a house almost on the site of the present Redruth Gas-Works in the year 1780.

This house is still in existence, and is now preserved as a Museum by the Old Cornwall Society.

Mr. F. G. Kingwell was re-elected Hon. Secretary for the fifteenth occasion.

Newcastle Business Girls' Cookery Lectures

M.P.'s Wife Opens Gas Company's Course

A hundred or so young women from the staffs of Newcastle and Gateshead business firms made up the audience at a cookery demonstration given in the Gas Company's premises, St. John Street, Newcastle, on Jan. 30.

The demonstration was the first of the fifth series arranged by the Gas Company for business girls. The enrolled students will attend six Thursday night demonstrations in all, and a similar course for another body of girls will run on Tuesday nights.

The opening lecture was given a formal opening, Mr. J. R. Hepple, Sales Manager, presiding, and Mrs. T. Magnay, wife of the Member of Parliament for Gateshead, making an inaugural speech.

Miss Elsie Morrison, Cordon Bleu, was the demonstrator, and she not only gave recipes and showed the methods of preparation and cooking, but gave many useful hints on marketing and economy.

Scottish Junior Gas Association (Western District)

Annual Social

The Western Section of the Scottish Junior Gas Association held their Annual Whist Drive and Dance in the "Georgic," Glasgow, on Saturday, Feb. 15. Sixty-five members and friends thoroughly enjoyed this happy function.

Mrs. Bujnowski presented the prizes for whist to Mrs. W. Davidson, Miss Stoddart, Mrs. E. M. Stewart, Miss G. Millet, and Messrs. W. M. Gledhill, J. A. Bulloch, John Clark, D. D. Melvin. On Mr. W. Kirk's (Secretary) proposal, the company accorded their thanks to Mrs. Bujnowski for presenting the prizes.

Presentation of President's Medal.

Mr. Greig (Glasgow), last year's President, in presenting the President's medal to Mr. Alexander Bujnowski (Glasgow), referred to the very real service which the latter had rendered the Association.

Mr. Bujnowski in reply said that the very high standard set up by Past-Presidents since 1904 made him wonder when he was appointed their President whether he would be able to uphold it. He said he greatly appreciated the high honour the Association had bestowed on him. He thanked Mr. Greig for his kind remarks regarding his work for the Association, and said that his duties had always been very pleasant ones. He was very pleased indeed to accept this medal, which would always remind him of this very memorable year of his life.

In conclusion, the President referred to a passage from a lecture he had heard which he thought embodied the very essence of all their motives as Juniors. It was:

> Labour is toil with no end in view beyond subsistence. Work is labour for the accomplishment of something—activity with a plan—a better sense of things. But Service, which is the highest form the fulfilment of our duties to our employers can take, is working for another, thereby rendering a benefit, kindness, or assistance.

The "Matchless" Lighter

A Useful Gas Cooker Attachment

Passing mention, together with an illustration of the device, was made of the "Matchless" gas cooker lighter in our issue last week in connection with the display of Stoves, Ltd., at the Birmingham Section of the British Industries Fair; but, by reason of its usefulness, a more detailed description of this cooker attachment will be of interest to our readers.

The "Matchless" lighter ignites the hotplate and oven burners of a cooker easily and quickly, saving the cost and trouble of matches. It is simple to operate with one hand only by opening the small tap and turning the button to the right. The length of flame can be reduced or increased by means of the set screw at the bottom of the lighting tube. A safety lock ensures that the gas is turned off before the lighting tube can be replaced. To replace the tube it is only necessary to turn the small tap upwards, which turns off the gas and opens the safety lock, enabling the lighter to rest in its "out of use position."

An important feature of the lighter is that the cost of maintenance is almost negligible. The flint is claimed to give many thousands of sparks and lasts a considerable length of time without renewal. When a new flint is eventually required, it can be inserted quite simply by the consumer without calling in the aid of a fitter.

FURTHER NEWS FROM THE
British Industries Fair

GAS ACTIVITIES AT OLYMPIA AND THE WHITE CITY | **ADDITIONAL EXHIBITS AT BIRMINGHAM** | **OFFICIAL VISITS OF THE JUNIORS AND SALESMEN**

The Gas Light and Coke Company and the South Metropolitan Gas Company both have interesting displays of Chemicals and By-Products at the London Section of the B.I.F. at Olympia.

These two large London Gas Undertakings once again stage what must undoubtedly be regarded as striking displays on their adjoining stands at Olympia. Considering the class of product to be exhibited—chemicals, tars, and other by-products of the carbonization of coal—which can hardly be claimed to lend themselves to attractive display work, these two Companies are to be congratulated upon setting up stands which do definitely draw attention by reason of the pleasing and interesting manner in which the exhibits have been treated.

The stand of the Gas Light and Coke Company shows the various products pleasingly arranged on glass shelves, full advantage being taken of lighting effects and the many different colours of the chemicals displayed. A mural impression at the back of the stand gives representations of the Beckton Works together with a by-products "tree," showing how all the various products are obtained from coal through carbonization and the other processes.

An information bureau, fitted with the latest "Portcullis" built-in gas fire, completes a very interesting exhibit, which includes specimens of their range of tar products, which result from the distillation of over 32,000,000 gallons of tar per annum. All products are ordinarily made to standard specifications, but in some instances exceptional requirements of clients can also be met.

The principal tar products exhibited are: Refined tars, pitches, creosotes, carbolic acids, tar spirits comprising benzenes, toluenes, and xylenes, pyridines, naphthalenes, &c. Pitch is supplied in a number of grades to meet the particular needs of various industries.

Particular attention is paid to road tars, and intensive research has resulted in the production of road tars of great durability and non-skid properties.

Naphthalenes are produced in various forms ranging from crude for firelighter purposes to highly refined crystal form for use in the dye industry. Ball, flake, and powder are also produced. Of particular interest to the plastic trades is the range of phenols, carbolic and cresylic acids. The erection of a new carbolic plant has enabled the firm to produce phenol of the highest purity and cresols of special boiling ranges. A number of xylenol fractions are also produced.

Another interesting product is pure pyridine, which is produced within a very narrow distilling range. Cyanogen products are also exhibited, comprising yellow prussiate of potash, bronze blues, sulphuric acid, and green copperas. The prussiate of potash is of exceptionally pure quality, and is produced in small crystal form, which is much easier to dissolve than the old form of large crystals.

The "Beckton" brand of neutral sulphate of ammonia is in evidence, also liquid ammonia of B.P. quality.

The "Busy Bee."

The by-products displays of the South Metropolitan Gas Company always show considerable originality, and their stand on the present occasion is no exception. The central theme embodies a representation of a huge bee settling upon a proportionately large honeycomb, each section of which contains a glass bottle holding one or other of the Company's chemicals or by-products. The analogy drawn between the work of the honey bee and that of the Gas Industry is a good one! Attractively arranged around the stand are further exhibits of the Company's products, while beautiful wall pictures in bas-relief draw attention to various applications of the chemicals displayed.

"Metro" coal tar and ammonia products resulting from the purification of coal gas and the distillation of coal gas tar are shown, and modern gas lighting in and around the exhibit helps to draw attention to the display of products.

"Metro" road tar, to which much research has been given by the manufacturers for some years past, is now supplied in varying grades to meet all local conditions where it is to be used. Special grades are also prepared for summer treatment of main roads. Whether for surfacing, tarmacadam or grouting, road tars bearing the "Metro" signature are British made, economical, hard wearing, and provide an efficient non-skid surface.

Several other "Metro" chemical products of equal importance are exhibited, and salesmen are in attendance to answer any enquiry concerning them. "Metro" dry neutral sulphate of ammonia, containing 25·71% ammonia, which is equal to 25·14% nitrogen, can be stored for long periods without changing its composition or affecting the sacks in which it is transported. "Metro" disinfectant fluid, apart from being over four times more powerful than pure carbolic acid, is easily mixed with hard, soft, or even sea water.

"Metrotect" is an antifouling composition specially prepared for the treatment of under water iron structures and ships' bottoms. "Metro" creosote for preserving railway sleepers, telegraph poles, outhouses, and fences is supplied either for direct application or by impregnation under heat and pressure.

"Metro" benzole, anthracene, naphthalene, sharp oil, pyridine, sulphuric acid, sulphate of iron, coal tar, pitch, and solid smokeless fuels are also displayed.

At the White City

Reference to the London Sections of the British Industries Fair would not be complete without mention of the considerable part played by gas at the White City, where it is not merely being displayed from a publicity standpoint, but is definitely fulfilling essential services in a manner which much appeals to the thousands of visitors to this Section of the Fair. In this way, therefore, gas is doing its own advertising—and much advantage should accrue from so comprehensive an installation.

The Gas Light and Coke Company have fixed no fewer than 1,242 gas fires—on this occasion advantage being taken of the many attractive coloured finishes available—in addition to 444 gas radiators, and 20 radiant surface combustors to heat the twenty-six exhibition halls, while eighteen single-point water heaters and three "Equator" storage heaters, 17 cookers, 9 wash coppers, two grillers, one pastry-oven, and 150 stand-by lamps add to what we have already called a comprehensive installation. The Fashion Theatre and adjoining dressing rooms for the mannequins also depend upon gas for warmth, this being provided by central heating plant by Thomas Potterton (Heating Engineers), Ltd., on their new low-pressure system, which also heats the galleries throughout the exhibition from Shepherds Bush to Wood Lane. It is estimated that thirteen million cubic feet of gas will be burned during the fortnight of the Fair. Considerable improvement is noticeable in the settings of the gas fires which have been modernized since the previous Fair.

A splendid tribute to the service gas can render at exhibitions of this nature is paid by this large installation at

the B.I.F.—but we are prompted to suggest again, as we did a year ago, that the Industry is inclined to be too modest in regard to what it is doing in this respect. The fires, radiators, and possibly the surface combustors are unmistakably gas to the layman; but does he realize that all the central heating, the provision of hot water in the cloakrooms, and even the very food he consumes at the exhibition, also depend upon the self-same fuel? Why not draw his attention to it more forcibly?

—And Birmingham Again

Returning once more to the Birmingham Section of the Fair, it is to be noted that plant of interest to the Gas Industry is to be found among the many outdoor exhibits adjoining the Fair buildings.

For instance, Pegson, Ltd., of Coalville, Leicestershire, are demonstrating their magneto-operated power rammer, an example of this machine being shown with sections cut away in order that the internal mechanism may be seen. This machine illustrates clearly the simplicity of the movements and the precision with which each part is made.

On this stand are also displayed the new "Peglite." This ingenious unit has been designed to eliminate the need for manually-operated "stop" and "go" signs. It consists of a tower in which are a red and green glass marked "stop" and "go" respectively, behind which a light is shown at predetermined intervals. This unit is inexpensive to run and fully automatic in operation. The light is supplied from a gas cylinder. The "Peglite" is being shown in operation during the whole period of the Fair.

Another display of interest to Gas Engineers in the Engineering Section at Birmingham is that of Rotherham & Sons, Ltd., of Spon Street, Coventry. On this stand are shown exhibits of high-class accessories applicable to the engineering, machinery, and allied industries, comprising sight and drip feed lubricators, gauges, tee pieces, elbows, grease cups, valves, taps, oil pumps, clocks for recording drums and time switches. Also displayed are examples of the firms's gear wheels, quadrants, pinion shafts, counters, pressure gauge movements, limit gauges, and all types of light repetition machinery which can be produced to customers' own specifications.

The Juniors Visit Castle Bromwich

On the occasion of the official visit of the British Junior Gas Associations to the British Industries Fair the members were entertained at luncheon in the Bradford Dining Rooms at Castle Bromwich on Thursday, Feb. 20, by the President and Council of the Birmingham Chamber of Commerce.

The Chair was taken by Col. O. B. F. Planck, D.S.O., T.D., D.L., who is a member of the Fair Management Committee. There was an excellent attendance, the room being taxed to capacity.

The Loyal Toast was duly honoured on the call of the Chairman.

In proposing "The Gas Industry," Col. Planck welcomed the Juniors to the Birmingham Section of the Fair. He was extremely pleased when the Fair Management Committee asked him to preside at the luncheon that day because, as it happened, he did know something about their Industry, being connected with it more or less directly through a number of different channels. Though present as a member of the Management Committee, he also represented the Society of British Gas Industries on the Gas Industries Section, in addition to having the honour to be an Associate of The Institution of Gas Engineers. "This year," Col. Planck continued amid applause, "it is a pleasure to welcome back such an increasingly important and virile industry as the Gas Industry."

It was most gratifying to the Fair Officials to realize that they had visitors from seven district Associations, stretching from Scotland down to Cornwall. He paid tribute to the Directors and Management of the undertakings who had shown their appreciation of, and interest in, the Junior Gas Associations by kindly making it possible for so many of them to be present that day. He then went on to refer to the Gas Section. "I think it is agreed on all hands," he said, "that you have just cause to be proud of your Gas Section." Visitors could not fail to note the great improvement in the section. He did think that they might claim that the industrial stand organized by the British Gas Federation was one of the finest exhibits at the Fair. British industry was in its broadest sense realizing more and more the unique qualities of gas as a fuel. The Industry ought not only to profit by every new industry, but should also find increased markets in existing ones. There was no town or city in this country where an industrial load did not await their capture. To obtain this business a high degree of technical knowledge was required, and it was very pleasing to see such a good representation of the engineering and technical brains of the Industry present that day. Naturally in a junior association there was a high percentage of young men because, as they knew, pioneer and shock troops were always drawn from the young members, and it was up to those young men to show to the manufacturers what gas could do and to prove to him that it was the fuel he really needed.

Col. Planck concluded by drawing attention to the obvious necessity for the closest collaboration between the Gas and all other industries. The engineering and technical staffs must provide cheap gas of uniform quality, the distribution staff must assure him of ample supplies at regular pressures, and the duty of the sales side was to see that the advantages of gas were brought before all manufacturers.

A Unique Occasion.

Responding to the Toast on behalf of the Junior Gas Associations, Mr. F. G. Higton, Hon. Secretary of the London and Southern District Junior Gas Association, said there were many important occasions in the programme of the Junior Gas Associations, but the present event promised to be one of the greatest. They had their Joint Conference, but the visit to the Birmingham Section of the Fair was the only time when they had the pleasure of the whole company of the Junior Associations being present. Therefore, he suggested, the occasion was unique.

For many years they had visited the Fair, but unfortunately there had come a gap. But this gap had only served to enhance the pleasure of that day's visit. That pleasure was threefold, for they had been privileged to view the greatest Fair, honoured to be the guests of the Birmingham Chamber of Commerce, and gratified by the splendid attendance. Enlarging on the subject of Junior Gas Associations, Mr. Higton pointed out that they had, in the company of Juniors, departmental chiefs of no small importance, eminent chemists, and many brilliant students. To overlook that fact would be shortsightedness. The policies of gas undertakings were dictated by boards of directors, but the liaison officers were, perhaps, more represented by the members of the Junior Gas Associations.

Present with them that day they had many leaders of their great Industry. He made particular mention of Mr. A. W. Smith, General Manager of the Birmingham Gas Department, Mr. E. B. Tomlinson, the Engineer-in-Chief, and Mr. G. M. Lewis, Controller of Gas Sales, as well as Dr. C. M. Walter. He also introduced Mr. R. J. Rogers, Managing Director of the Parkinson Stove Works, and Mr. R. J. Milbourne, who, as Mr. Higton pointed out amid applause, was "patron of the Midland and London Junior Associations and the friend of all."

Mr. Higton continued: "It is my pleasure to serve on many of the Committees of the Junior Gas Association, but I would like to stress the tremendous importance of maintaining the calibre of the Gas Industry. Its future success turns on this, and that calibre can only be maintained by inducing the right men to enter the Industry's ranks by proper recognition of their ability." These remarks were greeted with prolonged applause.

Having thanked Col. Planck, the Fair Management Committee, and the Birmingham Chamber of Commerce for their tremendously warm hospitality, Mr. Higton proposed that the company rise and drink the health of the Birmingham Chamber of Commerce coupled with name of Col. Planck.

Col. Planck briefly responded, and the members rose to continue their tour of the Fair.

The Salesmen at the Fair

On Friday, Feb. 21, gas salesmen from all parts of the British Isles were entertained at luncheon at Castle Bromwich Section of the Fair by kind invitation of the Management Committee and the Birmingham Chamber of Commerce.

Mr. Frank Wain, Chairman of the Publicity Committee, presided.

The Loyal Toast having been honoured, Mr. Wain proposed "The Gas Industry." He opened in humorous vein by saying that he was very disappointed that veal had not featured on the menu, for on that occasion were they not welcoming back the prodigals? and he apologized for the absence of any "fatted calf." He went on to say how delighted they were to have the Gas Industry back at the Fair, for they had missed them very much indeed and, he added amid applause, "We hope you will never leave home again." Referring to the advent of competition, Mr. Wain said that in those days people told the Gas Industry that it was finished, but with a spirit that was characteristic of the British the Industry had fought back splendidly. They had put their backs to the wall, and to-day they were not dead by any means. That, he thought, was certainly typical of the British nation. To-day there was plenty of room for both gas and electricity, and he expressed the hope that the Gas Industry would long continue its useful service to the community.

Responding to the toast, Mr. H. Stanley Taylor, President of the British Commercial Gas Association, said that although the Chairman had expressed disappointment, he rose expressing exhilaration, for it was a great pleasure to meet so many men connected with the Gas Industry. If the Chairman was disappointed they were not. He was sorry that the Industry was not represented officially at the Fair last year, but expressed the hope that they might meet there for many years to come. He thanked the company for the way in which they had received the toast, and reminded them that they were connected with a very interesting Industry. The foundation or basic principle upon which it was founded was sound economically. While the production of gas might be considered in some respects a monopoly, it had many competitors. Last year showed that competition, far from reducing the demand for gas, was actually stimulating it. The total number of gas consumers in the British Isles and the annual output of gas had risen to higher figures than ever before recorded. In spite of a mild winter, the total output of gas last year rose to the enormous figure of 332,169 million cu.ft., the previous record being in 1932. The Industry now had over 11 million consumers, which went to prove, allowing an average of four persons per family, that almost everybody in areas where gas was available was enjoying the benefits of a gas supply. In the last two years the number of consumers had increased by 4·9%, while the total of those who obtained gas on prepayment slot meters had risen by 8·8%.

"As some indication of the A1 health enjoyed by Mr. Therm at the present time," Mr. Taylor continued, "I give you comparative figures for the last ten years: In 1925 the annual output of gas was 294,756 million cu.ft.; to-day, at 332,169 million cu.ft., it shows an increase over the former figure of 12·7%. During the same period the total number of consumers has increased by 26·8%."

Mr. Therm's A1 Health.

The statistics which showed the amount of gas purchased by trades and industries in this country were equally encouraging; for instance, in 1934 56% of the total gas sold in Sheffield was bought for industrial purposes. Last year the percentage had risen to no less than 62%. Rotherham could show equally striking figures, while increases in the amount of gas taken by industries in almost every important town in Lancashire reflected the healthier condition of that county's trades. The busy manufacturing centres in the Midlands, in the pottery towns, and in the South of England told the same story. With increasing industrial prosperity trades of all kinds turned to the Gas Industry to supply them with a fuel suitable for modern methods of manufacture. These figures should encourage every employee in the Gas Industry to be on his toes the whole time to make further efforts to expand the uses and applications of gas. They had a story second to none, a magnificent selling story. Mr. Taylor called the attention of the company to the many long-term contracts for gas lighting which had been signed during the past year.

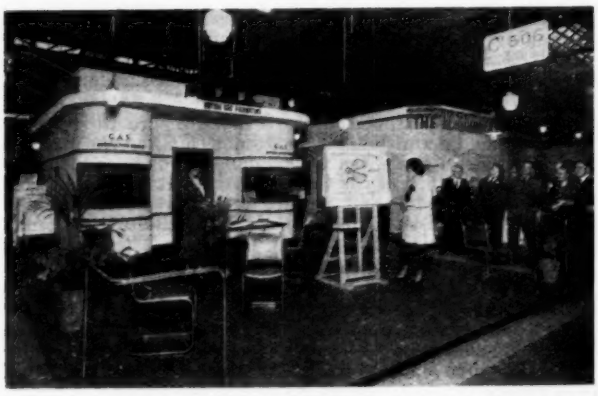
Gas was acknowledged supreme for large-scale cooking operations, and he drew attention to the fact that cooking in the House of Commons kitchen was now carried out by gas, an example followed in 1935 by many famous London restaurants. In large-scale water heating gas was making great strides. During the last year open-air swimming pools at Perth, Dunstable, Rochdale, Nottingham, and other towns installed gas-fired plant for heating the water, and many other new pools were in process of following this excellent example.

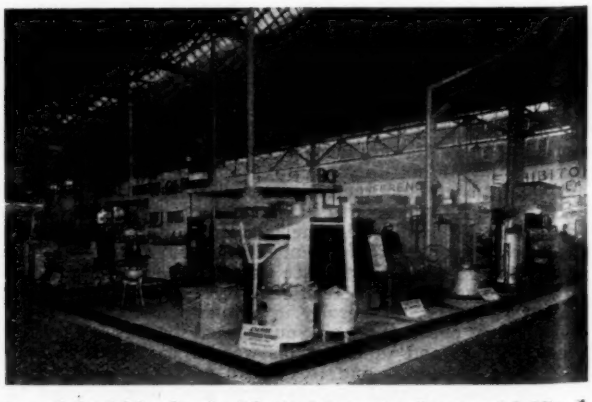
Finally, in the important question of housing, the Gas Industry's record in 1935 showed that those responsible for building operations of all kinds were alive to the efficiency, economy, and comfort of modern gas appliances in homes large and small. In Birmingham, for example, every one of the 42,000 dwellings erected by the Corporation had a gas supply. He added that the same was true of almost 100% of the homes in Manchester's new Satellite City, Wythenshawe. In Leeds the first-fruits of the Council's extensive housing schemes, a block of 940 flats, had gas laid on for various purposes.

These were facts which should make them proud of the services that gas could and did render to the community. Particularly they should encourage those on the sales side of their vast business.

In proposing a vote of thanks to their hosts, Mr. W. D. Rowe, Manager of the B.C.G.A., said that it was most fitting that they should have had the good fortune to have Mr. Wain, Chairman of the Publicity Committee, to preside at the luncheon on that day. He went on to refer to the industrial activities of the Chairman. Mr. Wain briefly responded.

B.G.F. Displays at Birmingham





Two views of the British Gas Federation displays at the Birmingham Section of the B.I.F. On the left the Information Bureau, with Miss Harrison, the B.C.G.A. lightning sketch artist, in action, while Mrs. Myers, the official receptionist, and an admiring group of visitors, look on. On the right is a section of the Industrial Exhibit.

Apprenticeship in the Heating Industry

Scheme for Recruitment and Training

The National Joint Industrial Council of Heating and Domestic Engineering have had under consideration the question of recruitment and training for the industry. A Committee of the Council was recently appointed to investigate the question of apprenticeship within the industry, to collect data, and to make recommendations with a view to increasing the number of properly indentured apprentices. The Committee has now presented its report to the Council.

For the purposes of the investigation, statistics were collected by the Secretary to the National Association of Heating, Ventilating, and Domestic Engineering Employers. The Committee states that the position in regard to apprenticeship in the industry is serious. The number of apprentices who have been engaged within the last five years outside London is almost negligible, and at the present time the proportion of apprentices to fitters' mates (*i.e.*, semi-skilled labourers) for the country as a whole is only about one to five.

The Committee recommends that as a matter of urgency steps should be taken to increase the proportion of skilled workers, and has drafted a scheme for the development of indentured apprenticeship.

The Council accepted the Committee's recommendation and decided to establish a National Apprenticeship Council, and in addition to organize throughout the country Area Apprenticeship Committees consisting of equal numbers of employers and operatives. Immediate steps are to be taken to establish the Area Committees, but the Council will defer questions relating to apprenticeship wages until the scheme has taken practical shape.

Athletic and Social

Perth Gas Department's Social Function.

The staff of the Perth Corporation Gas Department and friends held a very successful and enjoyable whist drive and dance in York House on Tuesday evening, Jan. 28, when 25 tables engaged in whist followed by a dance.

Mr. David Vass, Engineer and Manager, extended a welcome at the outset and later in the evening spoke of the previous efforts of his staff in a social capacity. This, their first indoor function, had augured well for it to be repeated annually. Ex-Bailie A. Gowans, Convener of the Gas Committee, in the course of a few remarks, mentioned that several large contracts for gas heating had been secured in recent months. The Convener went on to refer to the good relations existing between the Town Council and the staff of his Department and to the excellent results produced by the Department over a long period of years.

Mrs. Vass presented the prizes to the whist winners, and was awarded a vote of thanks on the call of Mr. A. Langlands (Clerical Staff), who also expressed thanks to the donors of the prizes and to all who had supported their first venture. The committee who had charge of the arrangements were Messrs. J. Reid, J. Harris, J. Kelly, L. Locke, and A. Langlands, the last-named performing the duties of card master at whist, Mr. Locke officiating as master of ceremonies at the dance.

A Children's Party.

The Lancashire Dynamo and Crypto, Ltd.'s, party for their employees' children, which is held annually under the auspices of the Social Club, was once more the occasion of nearly 200 children spending a very happy afternoon and evening.

After doing full justice to a very excellent tea they all enjoyed a Children's Pantomime which was very well given by several members of the firm. The rest of the evening was spent in various amusements, during which several photographs were taken, and terminated with the distribution of prizes, sweets, fruit, &c., by Father Christmas (Mr. H. P. Pentelow).

The whole evening was thoroughly enjoyed by all present, which included Mrs. and Mr. J. H. Dunbar (Director and President of the Social Club), Mrs. and Mr. W. A. Scott (Works Manager and Vice-President of the Social Club), Mr. A. W. Smith (Chairman of the Social Club), and Mr. J. T. Whalley (Secretary of the Social Club). Hearty thanks were extended to all members of the Committee and also those voluntary members who assisted to make this annual event such a happy evening.

Presentation to Wallasey Gas Official.

On Feb. 1 employees of the Wallasey Gas and Water Undertakings gathered at the Gas-Works, where a presentation was made by the Engineer and Manager (H. B. Holliday) on their behalf to Mr. F. A. Rhead on the occasion of his leaving Wallasey to take up the appointment of Chief Assistant Engineer and General Manager with the Exeter Gaslight and Coke Company.

In making this presentation, which took the form of a combination case of silver and cutlery, Mr. Holliday expressed the good wishes, on behalf of all the employees of his Department, for health, happiness, and future success to Mr. Rhead in his new sphere of activities, and spoke of the pleasant memories that would always remain at Wallasey of the work done and friendships made by Mr. Rhead during the past six years of his career at Wallasey. Mr. Rhead said how grateful he was for the expression of good wishes and for the very acceptable memento of his years at the Wallasey Gas-Works.

The meeting was then entertained by a cinema display of the recently made films showing the production and uses of Wallasey compressed coal gas and the erection and working of the new chemical treatment plant for the softening of water from the artesian bore holes at the Seaview Road Water-Works of the County Borough of Wallasey and others of interest. These two films were produced and also screened by members of the staff of the Gas and Water Department, in co-operation with the Wallasey Amateur Cine Club, and are very interesting records of work done, which in the case of compressed coal gas is somewhat in the nature of "pioneering."

Scottish Junior Gas Association (Eastern District)

Visit to Perth

Through the kindness of Mr. David Vass (Engineer and Manager of the Perth Gas Department), some forty members of the Scottish Junior Gas Association (Eastern District) inspected the Perth Gas-Works on Feb. 15.

The Perth Gas Department's Works are situated on the banks of the River Tay and some distance from the City. A complete new workshop was erected a year ago for the repair and maintenance of appliances. It includes a trichlorethylene degreasing plant and paint-spraying cabinet where all re-conditioned black cookers are finished with a mottled effect brought about by using a black base with aluminium sprayed on top after partial drying of the undercoat. The whole is stoved at 400° F. for one hour, the result giving a pleasing finish, durable, heat-resisting, and suitable for toning with most colour schemes.

The workshops, garage, and meter-proving station are heated by two gas-fired boilers and overhead hot water pipes. Glover-West vertical retorts with a new waste-heat boiler comprise the carbonizing unit. Two of the producers have been adapted to burn breeze freed from dust, thus liberating coke for the domestic market. The remainder of the producers will also be converted from open to pressure type grates suitable for breeze burning. Villages up to a distance of seven miles are supplied and the recently opened Municipal Aerodrome has been completely equipped with gas heating, cooking, and hot water appliances. To supply these outlying places, high-pressure gas is distributed from a gas-driven booster through governors at 130 in. w.g. pressure. The town supply is controlled by a Peebles patent automatic self-loading station governor which adjusts the pressure according to the load and is also fitted with baffles on the valves for seasonal adjustments so that a full range of pressures are available at large or small outputs. After the visit to the Works, members were entertained at tea by the Gas Committee at York House.

Bailie Gowans welcomed the Juniors on behalf of the Corporation. Mr. James M. Dow, Vice-President, Kirkcaldy, thanked Bailie Gowans for his welcome and Mr. Vass and staff for the splendid arrangements that had been made for the visit during the afternoon. Mr. Vass then made a few remarks, recalling his early experiments in oxide purification. He also stressed the need for the introduction of a gas unit so that consumers of both gas and electricity might be able to compare the merits of both on a more equal and understandable basis. Mr. George Dow, City Chamberlain, also spoke.

THE CO-ORDINATION OF National Fuel and Power Supplies

by O. W. ROSKILL

From a Paper presented to members of the Institute of Fuel at a Meeting held at Burlington House, Piccadilly, W. 1, on Thursday, Feb. 13.

A National Fuel Policy has often been advocated but never pursued. Among difficulties encountered have been (*a*) individual fuel industries are not sufficiently united or well organized internally to be able to pay much attention to co-ordination externally; (*b*) Government policy has been mainly directed at (i.) trying to prevent labour disputes in the coal industry, (ii.) trying to find revenue from taxing imported oil, (iii.) representing the consumer when monopoly rights are granted to public utilities.

There has been a general, if vague, realization that coal is a national asset which should be conserved and efficiently utilized as far as possible and that the coal industry is the most basic of the basic industries on which the prosperity of the country largely depends, but little attempt has been made to follow up this line of reasoning in practice.

The National Fuel and Power Committee, under the Chairmanship of the late Lord Melchett, was appointed in August, 1926, but dealt mainly with reforms inside the individual fuel industries—*e.g.*, reform of gas legislation (second report January, 1929). Legislation affecting gas and electricity has dealt mainly with problems internal to those industries with little or no attempt at co-ordination between them.

A National Fuel Board was included among the proposals of the Samuel Commission of 1926, but, like many of their other conclusions, little has yet been done in the way of implementation. There is in this connection something of a parallel in the proposals sponsored by Lord de la Warr and others for a National Food Policy and a Ministry of Food to co-ordinate the activities of the Ministry of Agriculture with those of the Board of Trade (for instance, on trade agreements with food-exporting countries) and with the dietary work in relation to unemployment associated with the name of Professor Orr, while the proposals for co-ordination of the fighting services in a Ministry of Defence may also be mentioned.

Later Sir Arthur Duckham made some similar suggestions regarding a Ministry of Fuel at the World Power Conference in 1928, and in 1934 in an Address to the Joint Gas Conference at the British Industries Fair Dr. E. W. Smith also proposed the formation of such a Ministry which would co-ordinate and regularize all matters relating to the production, distribution, and use of coal, gas, coke and electricity, and under whose wing would be placed the Ministry of Mines, Electricity Commissioners, and Gas Section of the Board of Trade. Other authorities have, both in Papers to the Institute of Fuel and in other ways, made similar proposals.

Central Marketing of Coal.

Central marketing (along the lines of the recent Lancashire scheme) is coming to be widely accepted as one of the most important immediate objectives in the coal industry, and recent pressure from the Government in the face of the strike threat has ensured its speedy adoption. There is widespread feeling in the coal industry that the larger gas and electricity undertakings using their strong purchasing power to bargain with several collieries, have often obtained their coal too cheap, and that without any question of raising prices to unjustifiable levels, more efficient marketing by the coal industry could redress this position. A special tax on coal sold to utilities to enable miners' wages to be raised has even been discussed, but it is probable that the recent voluntary agreement (with certain qualifications) on the part of the public utilities to an increase in the price of coal on forward contracts will remove the necessity for any action on such lines.

Dormant almost since the war, considerations of national defence have, in the last few months, begun to command attention. Should there be a return to the policy advocated by Admiral Fisher of national oil reserves stored against emergency? What part should the conversion of coal into oil play in the national defence programme and how far should the location of plants for the purpose be guided by considerations of vulnerability? Should any provision be made, as in other countries lacking in oil supplies, for use of fuels, for instance for motor vehicles, which are not always economic in normal times—such as compressed gas or charcoal?

Policy of Local Authorities.

Again, the relations between local authorities and public utility undertakings give rise to parallel difficulties. Electricity supply undertakings sometimes complain that where they serve an area including a number of towns which own their own gas undertakings, deliberate obstruction by the municipalities concerned has taken place. Gas undertakings have produced parallel examples of new "all-electric" housing estates erected by a municipality which also owns an electricity distribution undertaking, where pressure is put on the tenants in one way or another against the use of gas.

The Gas Industry, through its co-operative action in forming the British Commercial Gas Association, was a pioneer in joint sales development and propaganda work. The Electrical Development Association and the Coal Utilisation Council have followed suit, and the total expenditure by these bodies is now quite a considerable one, while a good deal of competitive propaganda undoubtedly takes place.

Has the time come when sales development work can be regarded from the aspect of increasing the total fuel and power consumption, rather than that of any one form of heat, and of improving the efficiency of utilization?

It is in this connection particularly significant that although there is a great deal of talk of the consumer and his preferences in the fuel industries, there are still many people who, while professing the long-term view, actually succumb to the short-term one of pushing their own fuel or their own company even when the former is not the most economic or the latter able to give the best service for the particular requirement. It may be argued that the pace in this respect is set by those who take the shortest view, but the change is nevertheless in progress, and it seems to be the job of all who have the ultimate benefit of the fuel industries at heart to promote it.

From the point of view of the Gas Industry the national fuel and power problem may be defined as that of organizing resources and equipment in such a way as to provide consumers with energy as cheaply and conveniently as possible, having regard to their requirements and preferences. It is a problem which is constantly changing as the requirements of consumers change and the resources of science enlarge.

Consumer Preference and the Industry as a Service.

The ultimate solution of the problem of competition between different sources of fuel and power should be based on the preferences of the consumer. But although the last word rests with him, his power of choice is meaningless, if—owing to differences of efficiency and organization—the cost of energy to him in one form is artificially rendered higher than in another. Accordingly, any attempt at planning and co-ordination of the fuel and power industries in the light of national requirements would seek not only to secure internal efficiency in the production of both electricity and gas, but also to prevent any rise in the cost of the two chief manufactured fuel services to the public through wasteful competition.

The Gas Industry, like the electricity industry, supplies a service rather than a commodity. Whereas formerly an undertaking was satisfied with delivering gas to the consumer's house, it now takes the responsibility of providing the user with apparatus, of maintaining it, of educating him in its use. This aspect applies to industrial as much as domestic users, and with the reduction in the price of gas—partly resulting from the increased distribution of purchased coke-oven gas by gas undertakings—and the growing demand for cleanliness and controllability in industrial fuels, the Gas Industry is supplying a continuously increasing proportion of its output for industrial purposes. The Industrial Gas Development Scheme and the system of Industrial Centres recently established in all

parts of the country, where consumers can obtain information about the fuel aspects of a much wider range of processes than would be possible from the technical or sales department of an individual undertaking, indicate that the importance of this trend has not passed unrecognized by the Industry. On the other hand, when any attempt is made in this country to organize anything on an area basis, the jealousies which have, sometimes for generations, existed between leading towns in many areas make the achievement of intimate co-operation very difficult.

The Gas Industry has not been free from this difficulty—nor indeed from the troubles arising from jealousies between different areas, and although much has been done in the right direction by many of the broad-minded leaders of the Industry it cannot be over-emphasized that if, as seems probable, the future organization of the Industry is going to be increasingly on a regional basis, parochial jealousies will have to be surmounted.

There has been a notable change in the public attitude to monopolies in recent years which suggests that if the Gas Industry were being established to-day it would be given a considerably greater measure of freedom than was the case 100 years ago. The progress made in the structure, organization, and outlook of the Industry has outrun the restrictions placed on its early relationship with the public; and the London Passenger Transport Board, though still anathema to some of the old school of individualists, has shown that monopoly powers are not incompatible with internal efficiency and service to the public.

Owing to the obligation of gas undertakings to supply any consumer within a certain distance of the mains at not more than a fixed price per thermal unit, a small office with one gas ring on which a kettle is boiled five times a week for tea, is being supplied at the same price per therm as the household which consumes gas for all cooking purposes, where cost to the gas undertaking is out of all proportion to the price charged. Electricity undertakings are less restricted in this way and can arrange their tariffs to favour the large consumer as well as having the right to make a minimum charge.

Physical Amalgamation and Regional "Grouping."

The grouping of undertakings on a regional basis, not necessarily to secure physical amalgamation but in order to provide the requisite commercial, technical, and financial facilities as economically as possible is, as indicated above, a current trend of the greatest importance. Compulsory powers may be necessary to secure orderly progress in this direction and to avoid haphazard grouping without due regard to geographical and technical requirements, and the whole basis needs careful working out.

As far as production of gas is concerned, the size of the producing unit is in the main dictated by the population of the area to be served; and a relatively small gas-works can often produce as cheaply as a large one. On the other hand, the efficient administration of the small gas undertaking tends to be very expensive, owing to the technical and expert staff having to be carried on a comparatively small output. Similarly, the disposal of by-products and the provision and maintenance of equipment in the home and in the factory call for organization in terms of units of considerable size. Thus while small-scale production may be economic, small-scale organization and administration is not. There may be no case for a "national gas grid," but the case for the provision of regional services for the Industry is a strong one. The distinction to be borne in mind is that between reduction in the number of producing units on the one hand, and the grouping of concerns under unified technical and commercial management on the other.

Although the present trend is rather towards grouping of undertakings in holding companies, it must not, however, be thought that individual undertakings have given up the idea of physical amalgamation. Many undertakings with the advantage of being able to purchase coke oven gas, have amalgamated with small neighbours and have arranged to sell gas in bulk to others.

While, however, amalgamation has proceeded some distance in the past, and may go further in the future, the main trend of development appears as stated to be towards grouping of undertakings in neighbouring areas in order to give them the benefit of certain common services, thus enabling them to reduce overhead costs. Grouping of this sort has been made easier under recent legislation than it was before the war.

This process of grouping has both good and bad points. In its favour is the fact that the various constituent undertakings can be administered more efficiently and economically through holding companies if managed with ability and vision than as small units. Finance, purchasing and technical assistance are cheaper and more easily forthcoming. On the other hand, it must be remembered that these holding companies may tend, for purposes of self-aggrandisement, to depart from sound policy and buy undertakings not properly related to their existing interests in a haphazard way or at excessive prices. Probably an impartial view would concede that they had done substantial good but that their growth requires to be watched carefully and powers obtained to check any tendency in the wrong direction.

It should be noted that development by holding companies has been severely limited by the existence of municipal undertakings, particularly in the North. It is usually either impossible to bring these into the group for political reasons, or else extremely troublesome on account of the fact that in many cases the whole of the rates is used as security for loans, and this position is bound to place a limit on the part which the growth of holding companies can play in the re-organization of the Industry, and to raise the whole problem of municipal ownership.

While the time is probably not yet ripe for change, and while there is an enormous body of opinion opposing any restriction on municipal trading, the trend nevertheless seems to be against the running of technical services by municipal committees. This does not mean a change from municipal control to private enterprise but rather that when the progress of grouping has progressed to the full extent, private enterprise and municipal enterprise may have to go together in the organization of regional gas Boards.

Future of Coke-Oven Gas Distribution.

Apart from places where the size of the market demands it, large-scale operations in gas distribution may lead to substantial economies in connection with the production of gas in coke-ovens.

The purchase and distribution of coke-oven gas by statutory undertakings must be considered as one of their essential functions from the national point of view, and for this reason the action of certain undertakings, such as Glasgow, which have refused to distribute coke oven gas largely for political reasons—such as that it would involve throwing out of employment a number of municipal employees in the gas-works—cannot be regarded with equanimity. Elsewhere, the attitude has been encountered on the part of local gas managers that the prestige of the Gas Industry would be weakened by the cessation or reduction of manufacturing operations, but it is nevertheless probable that the Gas Industry in some industrial areas will develop more and more into an organization for distribution and service rather than for production.

It was suggested above in connection with gas that a national fuel policy must be based on organizing available resources and equipment in such a way that consumers are provided with energy as cheaply and conveniently as possible, having regard to their requirements and preferences. The consumer is not, however, in fact free to exercise his choice unless certain specific conditions are on the way to realization. There must in the first place be a supply readily available. This supply must be available, in the case of electricity, at cheap rates for current. Further, there must be the necessary service and credit facilities, so that the costs of wiring, of appliances, or of maintenance are not an intolerable burden on the consumer. Then there must be a method of charging which is reasonably simple to understand, and which, so far as possible, follows the same lines all over the country; the consumer must feel sure that he knows exactly what he is going to be let in for. Finally, standardized voltage and frequency must enable appliances to be interchangeable, so that the consumer is not landed with useless apparatus and the manufacturer with inflated costs owing to having to supply an unnecessarily wide range of appliances for different voltages.

The basis of re-organization required appears to include the creation of a Central Development Authority which would be independent of Parliamentary interference in its everyday operations, although responsible to the Government in the sense of being a statutory body with defined responsibilities and the powers appropriate to them.

The Development Authority would be complementary to both the Central Electricity Board and the Electricity Commission. The Board has certain well-defined and limited functions of generation and transmission to carry out under the 1926 Act: it is a producer and a wholesaler of electricity and is not constituted to deal with distribution. The Electricity Commission is basically a judicial and administrative body, and while it touches a number of distribution problems in certain aspects of its work, its function is such as to make it unsuitable for taking an active part in developing distribution. The Development Authority should stimulate such activities as finance, publicity and propaganda, standardizing, testing and ap-

proving of consumers' equipment, prices of appliances to supply undertakings, economic research, and statistics.

While oil policy should be brought under the ægis of the proposed Ministry of Fuel, the oil industry, owing to its international position and to the lack of domestic oil resources, is not in a sense so closely associated with the three national fuel industries.

It has been said that the first stage in attempting a co-ordinated national fuel policy should be to trace the present lines of development of the chief fuel industries and then to note their points of contact; and having attempted the former some recapitulation of the latter is necessary.

Costs and Prices of Coal.

Perhaps the most important question is that of costs and prices of coal. There is no doubt that coal costs and prices are still susceptible to considerable reduction, particularly in the distributive field. Since an increasing proportion of the national fuel and power requirements is being consumed in the form of gas and electricity instead of raw coal, and since this trend is likely to continue, it is of the utmost importance that the gas and electricity industries should obtain their raw material at the lowest possible cost commensurate with economic and profitable working in the coal industry. Since at the moment they are being asked to pay increased prices they are entitled to enquire whether the coal industry is operating on the most efficient possible basis and if not, to co-operate in measures designed to achieve this end. The most cursory examination shows that the spreading of employment by the 1930 Act—while admitting that this Act has done much good—has sacrificed cost efficiency to spreading employment, and therefore in some respects to political considerations. The contraction of the surplus labour force is a problem of national concern which stretches far beyond the powers of the coal industry to deal with it, and the largest consumers of coal are surely entitled to demand that if, in order to avoid a labour dispute which would benefit nobody, they are to agree to increased prices, this should be regarded as a temporary measure—a breathing space during which internal re-organization covering, among other matters, labour and employment policy, concentration of production, centralization of colliery sales and organization of distribution shall be effected. This is, of course, without prejudice to the suggestion outlined in this Paper that in many cases the large utility concerns have in the past obtained their coal at prices which leave no profit margin to the mines—a situation which can be blamed on the collieries' failure to establish stronger sales organizations rather than on the utility companies.

Coke Oven Gas Distribution.

A question which intimately concerns the coal and gas industries is the future organization of coke oven gas distribution. While many authorities believe that in the future coking plants will form integrated units with steel works rather than coming under the ægis of the coal industry, this trend is never likely to proceed to the complete exclusion of coking interests from the coal industry, and the recent sharp rise in the demand for coke has even stimulated the erection and reconstruction of many pithead coke ovens. For the low-cost production of coke in this way a market for surplus coke oven gas is essential, while on the other side of the picture with the increasing importance of the industrial load to the Gas Industry, reduction in the price of gas to large consumers becomes essential in order to tap the largest possible potential demand. This can only be achieved by increased distribution of coke oven gas by the Gas Industry, and in spite of a certain amount of short-sighted opposition to this trend, there is beginning to be a change of view as to the functions of the Gas Industry, increased emphasis being placed on its distributive and service functions. But in spite of the pioneer work of the Area Gas Supply Committee there has been little attempt to plan any organized development of this trend jointly by the coal and gas industries, although examples from individual areas show that this cannot always satisfactorily be left to haphazard local agreements.

The position of local authorities as owners of public utility undertakings has been mentioned elsewhere in this report. While there is nothing to show that in general municipal undertakings in the gas and electricity industries are less (or more) efficient than company undertakings, and while the traditions of local government are not such as could or should be easily broken, there are beginning to be signs, particularly in the Gas Industry (for instance in the expansion of holding companies) that anomalies due to the existence of two different types of ownership will eventually have to be faced, and with an apparent trend towards the area co-ordination of managerially separate undertakings, some solution in the nature of Area Boards may have to be thought out.

It may be added that the ability to raise finance on better terms assists municipal undertakings on the average to sell more cheaply than company undertakings, but in their tariff structure the former very often tend to favour the domestic consumer and, in the case of electricity, the lighting load, whereas the companies tend to favour the industrial and power loads. There are, of course, certain conspicuous exceptions to this.

With the improvement in sales methods in the fuel industries which, in spite of the progress which has been made, still leave a good deal to be desired there has been increasing attention given to the requirements and preferences of consumers. A good deal of this, however, is still in the nature of " lip-service " and greater attention needs to be given to its implementation—largely a problem of personnel. The corollary of basing a national fuel policy on organizing available resources and equipment so that consumers are provided with energy as cheaply and conveniently as possible—as emphasized throughout this report—is that co-operation must be established between the various fuel industries based on a recognition of the economic market in each case. This does not imply a cessation of competition so much as a delineation of what in foreign policy is called " spheres of influence " and a change of attitude from active hostility and, what is in some ways even more surprising, complete lack of contact and interchange of views, to one of joint action where this can be achieved and competition on a more scientific basis where it cannot.

Tariffs and Legislation.

Examples of fields other than sales policy in which co-operation between the gas and electricity industries could be extended are tariffs and legislation. Both industries recognize that in certain respects their tariffs have shortcomings. In the Gas Industry a change is in progress towards wider adoption of the basic price system and attempts are being made to secure the removal of certain legal restrictions from which it is considered that the Industry suffers relatively to the electricity industry. In the electricity industry attempts are being made to secure a simplification of the multiplicity of tariffs now in use. It seems essential that some measure of co-ordination between the methods of charging in the two industries should be attempted, though it should not be forgotten that the optimum distribution of demand will be obtained if each industry builds up its own tariff structure.

Similarly there is the curious spectacle of both industries complaining to Parliament that they suffer from the unfair competition of the other through municipalities which own an undertaking favouring the use of the product of that undertaking in municipal houses and buildings. Yet no attempt is made to discuss and settle this problem directly between the two industries, although neither would favour any increase in Government interference.

The Gas Industry has more than once looked enviously at the powers and political unapproachability of the Electricity Commissioners and wondered whether the establishment of Gas Commissioners would not help to solve a number of problems in the Industry.

Since the majority of these problems lies on the distribution side it is possible that the creation of a Central Development Authority for Gas would both cover this need and promote the possibility of co-ordination between the two central organizations.

At the beginning of this Paper it was indicated that a National Fuel Policy must start with co-ordination at the Government end, and that with this in view a Ministry of Fuel is necessary to take over the activities of the Mines Department relating to coal, the Ministry of Transport relating to electricity, and the Board of Trade relating to gas (as well as, for instance, Government policy relating to oil). Only in this way can there be created one body whose duty it would be to watch and co-ordinate the trends in the chief national fuel industries.

I have to acknowledge the use for this Paper of material prepared by the Coal, Gas, and Electricity Committees of the Political and Economic Planning Group, although the use made of the material and the responsibility for the suggestions is my own.

Discussion.

Prof. C. H. LANDER said the Paper contained the most concise and best reasoned arguments he had ever heard for the co-ordination of our fuel industries, and in that connection he referred to the work of the Ministry of Reconstruction which was formed towards the close of the War which set up a Coal Conservation Committee working with five sub-committees—

viz., Mining, Power Generation and Transmission, Metallurgical, Carbonization, and Geological. Splendid work was being done in the direction of co-ordination, but unfortunately the economic conditions after the War caused the Coal Conservation Committee to be disbanded. Remarking that to have a separate Ministry of Fuel, as suggested by the Author, might be going a little further than was practicable, Prof. Lander said there was one point which should be kept fundamentally in mind, and that was the ultimate use to which the heat in the coal would be put. He strongly believed it would pay a Ministry of Fuel—if such were established—or the Ministry of Mines as at present constituted, to go to considerable trouble to find out what was the ultimate destination; whether it was to be used as heat as such—in which case one might expect to get a fairly high overall efficiency from the coal to the heat for process purposes—or whether the coal had essentially to go through the power stage. There had been a serious lack of enterprise in that such data had not been accumulated. It could be done quite easily, although at some expense—but the expense would be small compared with the importance of the subject—by taking, say, London and seeing what were the proportions in many cases where it was necessary to go through the Carnot cycle or the heat engine cycle. In this case, an efficiency of not more than 20% would be obtained. That matter had been put to the Samuel Commission on Coal and the now moribund National Fuel and Power Committee had had the matter before it, the attempt being made to deal with it not from the producing end but from the consuming end. As to the establishment of a new Ministry of Fuel, it was an anomaly that electricity should come within the purview of the Ministry of Transport and gas should come within the Board of Trade, but the fact that this was so did not necessarily indicate there was no co-ordination, and for that reason it might be going too far to have a separate Ministry of Fuel.

Mr. R. J. RESTALL suggested that in a considerable number of industries, and also in the case of domestic use of coal and its use for the generation of electricity, the needs could be well served by gaseous or solid smokeless fuel, although such a change over would take considerable time. The Gas Industry was quite well able to deal with a considerable amount of this change-over, but he did not believe anything would ever be done in this country with regard to the co-ordination of coal, gas, and electricity supplies until the Government took the matter very strongly in hand.

Captain J. G. BENNETT commented that, in fact, the gas and electricity industries were subsidiary to the coal industry. They took 10·3% and 6·9% of the disposable coal respectively, which amounted to only 27 million tons out of 160 million tons. The iron and steel industry took more coal than either the gas or electricity industry, and it was necessary to bear these figures in mind in order to get the right perspective. Continuing, he contended that the gas and electricity industries must expect to pay more for their coal in the future. The average price of coal at the pithead in 1934 was 13s. 6d. per ton, and the cost of production was only a few pence less at 12s. 11d. The total surplus was £4,000,000. The position to-day was that the conception of coal prices was largely based on the conditions of 30 to 50 years ago when small coals were a by-product to be disposed of at whatever price could be obtained. To-day, however, small coals were in greater demand and could be used with almost as great efficiency as the middle size coals and with greater efficiency than large coals. That was seen in the increasing tendency to-day to break large coals in order to produce sized coals to meet the demand. Last autumn one Yorkshire colliery was selling household coal at 24s. per ton, and the same coal was being broken into small sizes and sold to gas-works at 12s. 6d. per ton. He believed that that price was now a little higher, but not very much. The net result, reducing it to therms, was that the same coal was being sold for household purposes at 0·9d. per therm and for gas making purposes at 0·48d. per therm. The average price per therm for the total coal sold in this country was 0·57d. per therm, which gave an income to the industry in 1934 of £133,000,000. He suggested that this average price should be increased to 0·7d. per therm, with a highest figure of 1·1d. Such an increase would only mean an addition of ¼d. per therm in the case of gas and ⅛d. per therm in the case of electricity.

Mr. E. C. EVANS pointed out that an increase of 0·2d. per therm for coal was about 5s. per ton, and that would mean an additional cost of finished products of the iron and steel industry of something like 16s. per ton. In such circumstances it would be impossible for the British iron and steel industry to compete in the world's markets against the large cheap coal producing countries.

Clear Case for Co-ordinated Authority.

Mr. W. R. GORDON (Coal Utilisation Council) said that personally, and quite unofficially, he would welcome a Ministry of Fuel because it was a great anomaly that coal, gas, and electricity should be dealt with by three different departments. The case for a co-ordinated authority was quite a clear one, but the present position was one of those anomalies which had grown up with the British Constitution that we should handle things in the way they were handled at the present moment. While agreeing with Prof. Lander that it would not be a very easy matter to bring about this reform, it was, nevertheless, a necessary one.

Mr. G. M. GILL mentioned that during the past two years he had had an opportunity of investigating the conditions in a very large number of gas undertakings—some 70 or 80—and had worked out the efficiency in each case. It could not be said that many of these undertakings were in the first rank in this country, but the figures showed the highest thermal efficiency to be 80·9% and the lowest 51·4%, the average being 66·4%. This indicated that the gas process was an efficient one and that the Gas Industry utilized coal to very good advantage. He differed from the Author, however, where he said in the Paper that relatively small gas-works could often produce as cheaply as the large one, because gas making did not lend itself to the really small scale. The small village gas-works was a relatively uneconomic process. It was also stated in the Paper that coke oven gas was not favoured in a number of cases in the Gas Industry, but he believed that in most cases where it was not favoured it was because political influences interfered. He had found many of his colleagues in the Gas Industry were taking coke oven gas when it could be obtained at the right price and under the right conditions. Then Mr. Roskill had said that managers of local authority gas undertakings were opposed to holding companies, but his experience had been just the opposite. Those managers with whom he came in contact rather liked the idea because it meant the local authority undertaking would become a company undertaking, and nearly all these men preferred to work for a company than for a local authority. Speaking generally on the whole subject, Mr. Gill said it was very curious that electricity and coal should be governed in such a totally different manner. The electricity supply industry was being rationalized by a sane method which involved the shutting down of uneconomic stations, but the coal industry was pursuing the opposite policy. Uneconomic pits were being kept going, which was against the law of the survival of the fittest, and yet both were more or less under Government control. When that problem was solved and they acted in accordance of the law of the survival of the fittest in the coal industry, then they could look forward to cheaper coal, and it would follow that they should also have cheaper products generally.

Dr. R. LESSING said that ten years ago he had foretold there would be a tendency for the price of small coal to be increased and that there would have to be an adjustment of prices. That had been absolutely borne out by what had happened since, and he had no doubt that eventually coal would be sold not by its size but by its character. This raised the important point mentioned by Mr. Evans, that in our survey of the coal resources of this country we must not simply look to individual collieries or individual seams which might produce coal suitable for steam raising or gas making or cooking. We should have to split coal from all seams into the various components so that it could be led to the most suitable channels, for there was plenty of coking material in our steam coals and plenty of steam coal material in our coking coals if only it could be separated in the proper manner.

Need for Private Initiative.

The CHAIRMAN (Sir Philip Dawson, M.P.) after remarking that he would see that the Ministers concerned with this matter received a copy of this Paper—and adding he would try to see that they read it—said the formation of a Ministry of Fuel was far more difficult than appeared on the face of it. Nevertheless, he felt it was time the Government was made to realize that something definite must be done to bring about the co-ordination of all the coal mines in this country. Everybody wanted private enterprise, but there must also be private initiative, and unless there was private initiative the public would have to intervene. If something was not done voluntarily, then the Government would have to see to it that it was properly carried out, giving private enterprise every opportunity of doing it, not necessarily under Government control but under Government supervision.

Speaking of the gas and electricity industries, the view was expressed that these were far better administered at the present time than the coal industry. Perhaps a little more latitude should be given to the Gas Industry, and he believed the day was coming when some sort of gas grid system, on similar lines to that in many parts of Germany, would be adopted here. There was a good deal to be done yet with regard to electricity. Generation and transmission had been dealt with, and no doubt when the report of the McGowan Committee was issued, the distribution side would be dealt with. This was an important matter, because distribution represented 50% of the capital invested in an electricity undertaking. However, the gas and electricity industries could well be left in peace having regard to what was being done. At the same time, there was, unfortunately, some antagonism between gas and electricity, and he knew of instances in which a gas or electricity undertaking had bought up its rival and soon afterwards closed down the other works so that there was no longer any competition and only the one form of light, heat, and power was available. Personally, however, he saw no reason why gas and electricity undertakings should not be brought under one management, as was done so largely in America and on the Continent. There was competition between the two, but no antagonism.

The AUTHOR briefly replied to the discussion and agreed there would have to be a redistribution of prices as between small and large coal. In suggesting that small gas-works could produce as cheaply as large ones, he said it all depended on what was meant by "small" and "large," while he had also had in mind, in making the suggestion, that the savings were mainly on the administrative and distributive sides than on the actual production sides.

A GENERAL COMPARISON OF
Gas and Electricity for Heat Production

By A. H. BARKER, B.Sc., B.A., M.Inst.C.E.

From a Paper presented to members of the Institution of Civil Engineers at a Meeting held in London on Feb. 18.

The cost of an electric supply-station appears to be about three times that of a gas-works of equivalent output of energy. Although it is not possible to give an accurate general statement of the relative transmission costs (which vary greatly according to the method and purpose of the distribution and the nature of the country), a gas-main generally costs from three to five times as much as a corresponding buried electric cable, and from ten to twelve times as much as electric cables suspended overhead.

The cost of equipping buildings for the use of electrical power is, in the experience of the Author, usually from three to five times that of an equivalent system of gas pipes, but varies greatly according to the character and purpose of the installation.

TABLE I.—*Cost of Production of Gas and Electricity per* 100,000 *B.Th.U.*

—	Gas. Pence per 100,000 B.Th.U.*	Electricity. Pence per— 100,000 B.Th.U.	Unit.
For production of gas—			
Overall cost of coal . 5·2d.			
Less residuals . . . 3·4d.			
Balance . . . 1·8d.			
Net cost of coal	1·8	2·930	0·10
Purification and stores . . .	0·1	0·293	0·01
Salaries and wages, and management	0·7	1·460	0·05
Repairs to plant	1·5	1·750	0·06
Net cost as supplied to gas-holder or mains.	4·1	6·433	0·22
Interest and depreciation on capital, &c.	2·0	3·000	0·103
Gross cost at works .	6·1	9·433	0·323

* 1 therm.

The figures in Table I. have been summarized from published information supplied by the industries concerned, or from the general experience of the Author. The actual costs in any specified case are liable to vary so widely that general applicability of any such figures should not be assumed. They are intended only to give a general idea of the usual relative costs. They appear to show that, while the cost of generating a given energy-output is some 50% greater in the case of electricity than in the case of gas, the distribution-costs of electricity are from one-fifth to one-tenth of those incurred in the distribution of an equivalent amount of gas.

The principal difference between a gas-works and a power station is that while the latter is designed to produce electric power alone, the former produces, in addition to gas, a number of by-products and residuals which are of commercial value.

The difference in appearance is very noticeable; for example, the Battersea power station may be contrasted with the Fulham Gas-Works, or the Aldershot Gas-Works as seen from the Hog's Back. The psychological effect of such contrasts on the public may be very great.

Apart from its relatively high cost and the inevitable dangers attached to its use, electrical energy, if it could be supplied at any time in unlimited but controllable quantity, would be almost an ideal means for the production of any kind of heat. By its agency pure heat-energy can be delivered through flexible wires in any quantity, at any temperature, and in any desired form (convective or radiant, luminous or non-luminous, of any desired wave-length), without any kind of labour, trouble, or difficulty, to any accessible point in space.

There is no other source of heat which, at any moment, can be immediately and directly supplied to the consumer at any point where required, at any desired rate and temperature, and generally with almost 100% efficiency. Further, it does not need any intermediate heat-carrying medium, there are no products of combustion, no stand-by losses, practically no absorption coefficient, and only a very small time-lag. Electricity can be rapidly cut off, when not required, by the simple and almost frictionless mechanical movement of a switch, which may be readily operated automatically by a simple and reliable form of thermostat.

The use of electricity involves certain physical dangers to life and property, which, however, apart from accidents, are negligible if the apparatus is in good order and is properly designed and used. There exists no means whereby the energy can be stored in any useful quantity, except as heat at relatively low temperatures in large masses of heat-absorbing material, such as hot water or oil contained in large cylinders, the accommodation of which is inconvenient and expensive. The use of these is wasteful and the time-lag great.

The use of any other agent, including gas, gives rise, along with the heat, to the emission of products of combustion which are mainly of a deleterious character, and are at a high temperature; these products are, in many cases, difficult to deal with in a satisfactory manner.

Features of Gas as a Heating Agent.

Among the principal advantages are:

That it can always be regulated exactly to the requirements.

That, owing to the fact that it can be stored in great quantity, a large temporary increase in consumption is possible in order to meet an emergency or overload.

That, although serious breakdown is by no means unknown, it is less probable than with the more complicated electrical plant.

That in some cases the products, which are innocuous if complete combustion is effected, can be allowed to mix with the air heated as a diluent, and so secure, in a certain sense, an efficiency of 100%.

Among the disadvantages are:

It needs to be ignited and to be supplied with air before the heat can be developed.

It is odorous and dangerous if it escapes unburnt, or is incompletely burnt. Mixed with air it is highly explosive as well as poisonous.

Its combustion gives off gaseous products of combustion which have to be removed; this is not always easy with out incurring expense and a great loss of efficiency.

It needs attention to ensure that the burners are in good order and that the combustion is perfect.

Relative Danger.

It must be recognized that the use of any source of concentrated energy involves some degree of danger, especially when the energy is as easily convertible into other forms of energy as is that of gas or electricity.

Gas.

The dangers of gas are its liability to escape, its poisonous character, its explosiveness when mixed with air, and the high temperature at which the heat is necessarily generated, which thus involves risk of fire. Escapes may be due to defective piping, to lighted burners being accidentally extinguished, or to a tap being accidentally turned on. Buried pipes conveying gas are occasionally liable to underground corrosion or fracture. The gas thus liberated underground may travel a considerable distance in the substance of the road material, giving rise to explosions in houses unconnected to the mains, and even poisoning persons residing in such houses.

Processes are known by which coal-gas can be rendered non-poisonous. It is surprising that these have not received the attention of the Gas Industry or of the legislature. There is no greater deterrent to the general use of

gas than its poisonous character, due to its carbon-monoxide content.

Electricity.

The danger in the use of electricity is principally that of touching accidentally, or in ignorance, an exposed live conductor, which may result in the instant death of the person involved if his earth contact is good. Another risk is due to defective insulation causing a short-circuit or other defect, and thus giving rise to danger of fire. If electrically-generated heat cannot escape, it will accumulate until very high temperatures are reached; fire or an explosion may then be caused.

Most of such dangers can be guarded against by adequate care in the design, erection, and supervision of the installation. The dangers only become imminent when the construction is cheap and inferior in quality. The principal inconvenience met with in the use of electricity is its liability to breakdown. Such breakdowns may cause serious inconvenience and loss; it is only rarely that such inconvenience is prolonged, but when it arises its effect is widespread and has assigned to it a significance out of proportion to its real importance. Generally, however, such a breakdown is nothing more than a nuisance.

A general comparison of the relative dangers arising from the use of the two agents may perhaps be made from the figures in Table II., taken from the annually published Report of the Registrar-General for the year 1934.

TABLE II.

Fatal Accidents.	Gas.	Electricity.
Suicides	1,853	..
Accidental deaths	141	67
Deaths per million, excluding suicides.	3·35	1·6

As, however, the number of existing gas installations in the country is probably more than twice the number of electrical installations, it would appear that the accident-rate of the two is about equal.

Lighting.

The differences in practical use between gas and electricity may be briefly summarized as follows:

(1) Electricity "burns" automatically when switched on. Gas has to be ignited and kept supplied with air.

(2) Gas emits products of combustion which, although innocuous when combustion is complete, are otherwise obnoxious; they are debatably claimed to have a germicidal effect and to be more advantageous than deleterious. An electric light does not emit such products.

(3) An electric light, being completely shielded by the globe from contact with air or any surrounding objects, does not raise the air surrounding it to a high temperature; it can therefore be fixed almost anywhere with reasonable safety. A gas light generates a very high temperature and so cannot with safety be fixed near anything inflammable unless suitable precautions are taken.

(4) An electric light emits much less heat and creates less dirt; in consequence it can be fixed, focussed, or reflected on the exact spot required much more easily than can a gas light.

(5) An electric-light bulb can be renewed or changed in power in a few seconds by replacing the bulb. Changing a gas mantle, though cheaper, is more complicated and troublesome. A gas mantle is much more easily broken than an electric-light bulb.

(6) More attention is required to keep a gas burner in order than is necessary with an electric lamp. The former has to be periodically blown clear of dust.

(7) An electric-light lead is flexible and the light can therefore be fixed at practically any accessible point. A gas-pipe is much less flexible or adaptable, and it can be carried only to places where there is no danger of fire, where there is easy access for air and dissipation of products, and where the burner can be readily reached for purposes of ignition, cleaning, and other attention.

(8) An electric light can be operated from a distant switch fixed at any convenient point, but a gas light can only be so operated by the use of artificial and expensive means, such as pilot-lights or electric ignition. The regulation of a gas light is, however, continuous from zero to maximum power.

(9) A gas light at usual prices is substantially cheaper in fuel than an equivalent electric light of the ordinary type at present in use.

(10) The light from a good gas burner is softer and more pleasant to the eyes than that of an electric light of equal candle-power.

In the main these comparisons, especially those of convenience, show a definite advantage to the electric light for ordinary buildings where economy is not of paramount importance; so much so, in fact, as in most cases to counterbalance the relative cheapness of gas.

Exceptional cases are:

(*a*) Houses where economy is more important than convenience.

(*b*) In street and factory lighting, where the products of combustion are not of consequence.

(*c*) Where the lighting-units can be fixed in positions enabling ignition and the necessary attention to be easily performed.

(*d*) Where the character of the light produced is an important consideration.

TABLE III.—*Approximate Lighting Efficiencies of New Lamps and Burners.*

Source of Light.	Equivalent Lumens per Watt.	Equivalent B.Th.U. per Spherical Candle-Power-Hour.
Vertical gas-mantles	1·0	43·0
Ordinary inverted gas-burner	1·44	30·0
	2·0	21·5
Gas, using regeneratively-heated air	2·15	20·0
Electric carbon-filament lamp	3·0	14·3
High-pressure gas-burner	4·3	10·0
	5·0	8·6
Electric tantalum lamp	6·0	7·2
	7·0	6·1
	8·0	5·4
Electric tungsten vacuum lamp	9·0	4·8
	10·0	4·3
	11·0	3·9
	12·0	3·6
Electric tungsten gas-filled lamp	13·0	3·3
	14·0	3·1
	15·0	2·9
	16·0	2·7
Best modern electric lamp	17·0	2·5
	18·0	2·4
	19·0	2·25
Sodium lamp	20·0	2·15
Electric discharge lamp	30·0 to 40·0	1·44
Maximum hitherto attained experimentally	70·0	1·07
		0·62

Deterioration.

The practical question of the deterioration of the lamps and mantles is of importance. The life of an electric-light bulb is normally 1,000 hours, during which period it deteriorates by about 15 or 20%. The rate of deterioration of a good gas mantle is about one-third of this figure. The reduction of light is so gradual that it is usually not noticed until long after the mantle or bulb should have been discarded.

The cost of fuel may be taken as equal when, for instance, the prices per unit using new inverted gas mantles (30 B.Th.U. per candle-power-hour) and the best new tungsten lamps (16 lumens per watt) are respectively in the proportion of 10d. per therm and 3·85d. per unit. No valid practical comparison can be made unless the actual intensity of the lighting produced in each of the two cases is accurately measured by means of a photometer.

Street Lighting.

This appears to be on a different basis. Here the additional labour involved in lighting and in maintenance of the gas system is an important matter.

Here also there are numerous subsidiary considerations of a difficult character, for instance, as to whether a given amount of light of one kind actually produces as much, or less, or more, useful effect for the pedestrian or the driver of a vehicle through the darkened streets as the nominally equivalent candle-power of the other kind, and as to whether one kind is or is not more penetrating in fog or mist than the other, as well as other similar considerations. It is the Author's experience that a good gas-lit system of street lighting produces a considerably better effect than an electric system.

Judged on the basis of candle-power only, apart from the labour involved, the relative cost of gas and electricity for street-lighting purposes is probably as follows. If electricity for street lighting by tantalum lamps (6 lumens per watt) is supplied at a price of ½d. per unit, the equivalent cost of compressed gas at 10 B.Th.U. per candle-power-hour, to compete on the same basis, and apart from questions of labour, would be about 10·5d. per therm.

Domestic Hot-Water Supply.

Requirements vary widely in different houses, according to the cleanliness maintained. The bulk of the demand is satisfied if hot water at a minimum temperature of 130° F. is instantly available in the necessary quantity at any hour between about 7 a.m. and 11.30 p.m. There are also cer-

tain requirements which may call for temperatures up to boiling point, which would not involve the general system. The heat necessary for certain purposes is shown in Table IV.

TABLE IV.—*Usual Requirements per Person per Day*

Daily Requirements.	Equivalents (100% Efficiency).			
	B.Th.U.	Corresponding Units of Electricity.	Therms.	Cu.Ft. of Gas (Assuming C.V. = 500 B.Th.U. per Cu.Ft.)
One very full hot bath	20,000	6·0	0·2	40
Usual hot bath . .	10,000	3·0	0·1	20
Four full hand-basins	2,000	0·6	0·02	4
General domestic requirements per person per day, excluding laundry and above requirements	5,000	1·5	0·05	10

The amount of heat required daily for this service varies greatly according to the social standing of the individual concerned, as will be seen from Table V., and according to whether the user has to pay in direct proportion to the amount used.

TABLE V.—*Maximum Total Heat Requirements per Person per Day for Hot Water Supply.*

—	B.Th.U. per Day.	Electric Units per Day.		Therms per Day.	
		Efficiency 100%.	Efficiency 9.%.	Efficiency 100%.	Efficiency 50%.
Poor person .	3,000 to 10,000	0·9 to 3	1 to 3·5	0·1	0·2
Normal . .	30,000	9	10	0·3	0·6
High value .	40,000	12	13	0·4	0·8
Extravagant .	50,000	15	16	0·5	1·0

Differences between Gas and Electricity for Hot-Water Supply.

(1) Gas requires a separate furnace or boiler, but electrical heating can be applied in the interior of existing storage-cylinders.

(2) Gas, at usual prices, is about half the cost of electricity.

(3) Gas needs to be ignited, while electricity can be switched on from any point.

(4) Regulation and control by gas are easier and the heating may be much more rapid than can be effected by electricity, without incurring great expense.

(5) Electricity supplies the heat in a much cleaner manner at an efficiency of almost 100%, which is unaffected by accumulations of fur. Gas gives off products of combustion and works at a much lower efficiency, which is reduced as fur collects on the heating surfaces. Unless special provision is made for their evacuation, either by chimney or by some power-driven suction-device, the products will discharge into the air inside the house, causing sometimes smells and always an excess of humidity. Any metallic flue-pipe is subject to corrosion, and often to a down-draught.

(6) If a gas flame is extinguished or the combustion is incomplete, poisonous or explosive gases are distributed in the air inside the house.

(7) Gas apparatus requires more attention. Unless the apparatus is maintained in good condition, smells are produced and the efficiency falls seriously. Corresponding electrical apparatus requires no attention except for occasional cleaning and removal of scale.

Space Heating of Buildings.

In regard to central heating, the advantages of electrical equipment lie in greater convenience and cleanliness. The storage method has the additional advantage that a large reserve of heat in the storage tanks makes the heating-up of the radiator-system much more rapid than is possible with the gradual heating of the water by gas. A gas-boiler must be provided with an adequate chimney and requires more labour and maintenance. A comparison of the relative degree of danger between the two is difficult. The electrical installation might cause the immediate death of any persons touching a piece of live metal, while mishandling of the gas-plant or serious leakage might cause gas-poisoning or a disastrous explosion.

An electrical installation is more liable to breakdown than a plant heated with gas, but if the breakdown is, as usual, of short duration, it entails little or no inconvenience. A prolonged breakdown of an electrical system might enforce a temporary vacation of the building, whereas a similar breakdown with gas equipment could be remedied temporarily.

The warming of buildings by local heating involves completely different considerations. For various reasons the consumption of energy for local heating is much less than for central heating, the former method usually requiring about half the heat-units necessary with the latter.

The differences between a gas fire and an incandescent electric heater make a correct comparison between them difficult.

Ventilation.—The hygienic condition of a room is greatly improved by adequate ventilation. The cost is not only that of the waste gas which serves to maintain it, but also that of the heat, propagated as radiation, in the warm air of the room, and subsequently removed by the chimney.

A gas fire will often cause the air in the room to be completely changed five, or even more, times per hour, depending on the arrangement of the chimney-throat, thus discharging up the chimney the amount of heat needed to warm this volume of air from the external to the internal temperature of the room. The effect of this is to increase the amount of gas that it is necessary to burn in order to maintain the temperature of the room at the required level.

If this heat is assumed to be lost, the nominal efficiency of the fire is materially decreased. Thus, if a certain room, having a capacity of 2,000 cu.ft., normally requires 6,000 B.Th.U. per hour to warm it to 65° F. with two interchanges of air per hour, a fire of 50% efficiency, and using 25% cu.ft. of gas per hour, would be necessary. If the waste heat from this fire procures an additional, and possibly unnecessary, ventilating effect of, for example, 10,000 cu.ft. per hour, this alone would add about another 6,000 B.Th.U. to the heat required to maintain the room at 65° F. A gas fire using 50 cu.ft. of gas per hour would therefore be necessary. Thus, if the comparison is based on the original requirements, the efficiency of the fire, from that point of view, would be 25% instead of 50%, if compared with an electric fire of 100% efficiency which only procures the desired two interchanges of air. A direct comparison between the efficiencies of the two fires involves, therefore, some convention in regard to the loss of heat through the excessive ventilation that is induced by a gas fire.

A similar ventilating effect could be secured by the aid of electricity only, by the installation of a small electric fan drawing air from the room and discharging into the chimney or through some opening, through which the warmed air in the room could be evacuated to the outside of the building. Such provision is, however, rare in a private house or office. It is assumed to be provided in the following comparisons, in order to equalize the effects of the two sources of heat. The consumption of electric power for driving the fan will usually be about 5% of the power used to generate heat.

The combustion of gas as a means expressly for procuring ventilation (apart from the production of heat), is about ten times as expensive as the electric current required to drive a fan for the same purpose.

Cooking.

Electricity is cleaner in use and the apparatus generally is, in consequence, of smarter appearance. A gas cooker is much more rapid in action than an electric cooker, since the maximum power of a gas burner can be concentrated on the cooking vessels immediately the burner is ignited. Gas provides much better facilities for rapid heating, as the supply can be made much greater; the cost of electrical cables of adequate size for large powers would be prohibitive. With an electric heater there is greater absorption of heat by the surroundings, and as domestic cooking operations are generally conducted from cold, this feature reacts materially on the time occupied, which with electric power is 70% greater than with gas. An electric cooker is more comfortable to use than a gas cooker because of the hot products of combustion of the latter.

The possibility of danger is probably equal. The danger from gas lies in its poisonous and explosive character, but in practice accidental damage in consequence of these properties is rare. The possibility of shocks due to defective insulation of an electric cooker are about equally negligible in a properly-made plant.

The wastage of weight in the food cooked in an electric cooker is less than in a gas oven, on account of the removal of the vapours by the products of combustion in the latter case. The relative cost of gas and electricity, taken over a long period, was found to be that electricity at 0·5d. per unit is the equivalent of gas at 10d. per therm.

Since these experiments were made the efficiency of electric cookers has been materially improved. By calculation, it is estimated that, if the same experiments had been made with the most recent type of electrical cooker,

TABLE VI.—*Equivalent Prices of Gas and Electricity at the Various Assumed Efficiencies. Cost of Heat only, excluding Values of Special Features of each Heating Agent.*

Price of Gas per Therm—Pence		6	7	8	9	10	11	12
Equivalent Price of Electricity per Unit—Pence		0·205	0·238	0·272	0·306	0·340	0·375	0·41
—	Assumed Actual Efficiencies.	Prices of Electricity per Unit equivalent to Gas at above Prices—Pence.						
House lighting	Gas 30 / Electricity 3·6 B.Th.U. per candle-power-hour	1·72	2·00	2·30	2·58	2·87	3·15	3·35
Street lighting (normal)	Gas 10 / Electricity 2·85 ,,	0·70	0·84	0·96	1·08	1·20	1·32	1·44
Street lighting (most efficient known)	Gas 10 / Electricity 0·62 ,,	3·30	3·85	4·40	4·95	5·50	6·05	6·60
Domestic water heating—								
Central boiler	Electricity 100% / Gas 70 ,,	0·29	0·34	0·39	0·44	0·49	0·54	0·59
Local daily	Electricity 90 ,, / Gas 50 ,,	0·37	0·44	0·50	0·56	0·62	0·68	0·75
Instantaneous	Electricity 100 ,,	0·26	0·30	0·34	0·38	0·43	0·47	0·51
	Gas Tubular boiler 80 ,,	0·32	0·37	0·42	0·47	0·525	0·58	0·63
	Gas Geyser 65 ,,							
Space heating—								
Central	Electricity (storage) 85 ,, / Gas boilers 70 ,,	0·25	0·29	0·33	0·38	0·42	0·46	0·50
Incandescent fires (total heat)	Electricity 100 ,, / Gas 50 ,,	0·41	0·48	0·55	0·61	0·68	0·75	0·82
,, ,, (radiation only)	Electricity 65 ,, / Gas 45 ,,	0·30	0·35	0·40	0·44	0·49	0·54	0·59
Incandescent fires (total heat including ventilation)	Electricity 31 ,, / Gas 18 ,,	0·39	0·45	0·52	0·58	0·644	0·71	0·77
Non-incandescent surface (products removed)	Electricity 100 ,, / Gas 85 ,,	0·24	0·28	0·32	0·36	0·40	0·44	0·48
Non-incandescent surface (including products)	Electricity 100 ,, / Gas 100 ,,	0·205	0·24	0·27	0·31	0·34	0·38	0·41
	Nominal Efficiencies—%.							
Cooking—								
Oven cookery	Electricity 100 Gas 57	0·36	0·42	0·48	0·54	0·60	0·66	0·72
Hotplate cookery	,, 100 ,, 86	0·24	0·28	0·32	0·36	0·40	0·44	0·48
Total per annum for household	Electricity 100 / Gas 67	0·31	0·36	0·41	0·46	0·51	0·56	0·62
Furnace work—								
1,000° F. without regeneration	Electricity 100 / Gas 45	0·46	0·53	0·60	0·68	0·76	0·83	0·91
With regeneration	Electricity 100 Gas 60	0·34	0·40	0·46	0·51	0·57	0·63	0·68
Welding	Electricity 100 Gas 27	0·76	0·89	1·01	1·14	1·26	1·39	1·52

the results would have been that gas at 10d. per therm was the equivalent of electricity at about 0·7d. per unit.

General Conclusions.

The foregoing comparison indicates generally that the cost of most heating operations is substantially lower by gas than by electrical power at present prices. In the great majority of cases, owing to the absence of products of combustion and the non-material character of electrical power, it is always cleaner and generally more convenient both to install and to use, as well as more efficient in use than gas. In some cases, especially where the character of the heat, the absence of products and the small saving of labour and increase of convenience are not of importance, it is a waste of money to buy a high-grade type of heat for a low-grade purpose. It is only where its superior convenience, cleanliness, and control are of real importance and the financial aspect is less important, that electricity can be preferred to gas on grounds of economy. There are cases where the ease with which electrical power can be switched on and off is of such value that the facility does in fact reduce the total annual cost of electricity for a particular service below that of gas for the same service. In the majority of cases, however, where heat is required the difference in the amount used is not great enough to justify the use of the more expensive fuel on economic grounds alone. The auxiliary use of electrical power for increasing the efficiency of combustion of gas, and for removing the products of combustion, can effect a material improvement in the efficiency of gas appliances. The commercial hostility between the two industries is so acute at the present time that the use of the auxiliary power in this way is not favoured by the Gas Industry. It would be of great advantage to both industries, and not less so to the public, if the two were amalgamated. Table VI. summarizes the comparative costs for the various duties which have been considered.

The real question for each consumer is perhaps an individual one—namely, what is the value to the individual purchaser of the superior convenience and qualities of the more expensive form of heat? If that value is greater to him than the difference in the cost of the two fuels, then the use of the more expensive source of heat is justified; but where economy is the principal consideration the personal opinion of the Author is that gas will serve for heat-production in most cases, provided adequate care is taken that its dangerous features do not cause trouble.

Discussion.

Mr. S. B. DONKIN, commenting on the author's comparative figures of cost for gas and electricity, said he did not appear to have taken into account the value of the sale of by-products in the case of gas, nor had he taken into account any special generating efficiencies which might be brought about by thermal electric generation. Although mention was made of the disadvantage in the case of electricity that a greater disruption of supply would take place in the case of a breakdown of a generating station, the Paper overlooked the advantages of the Central Electricity Board's inter-connecting lines between one selected station and another, the object of which was to give another source of supply in case of one power station breaking down. Speaking of two-part tariffs, Mr. Donkin said the reason for these in the case of electricity was the inability to store electricity and therefore he was wondering why one of the London gas companies had recently introduced the two-part tariff. Perhaps it was due to the fact that the gas company wished to save storage capacity because of its cost.

Professor W. A. BONE, F.R.S., criticized in detail Table I. of the Paper giving the cost of production of gas and electricity per 100,000 B.Th.U. and said that a careful comparison of these figures with those given in the latest returns of the Electricity Commissioners gave a different result from what was acually being done in 1933, which were the latest figures available. Another matter was that according to the Commissioners' figures the losses were something like 18%—*i.e.*, only 82% of the current sent out reached the consumers—and there was no indication in the Paper whether that had been taken into account. After giving some calculations of capital charges for both gas and electricity and arriving at the result that these would be three times as high for electricity as for gas, Professor Bone said that, having studied this question for a good many years from the point of view of using the coal resources of the country, he believed that were it not for the necessity of getting a good load factor for our electric power stations—which was important because of the inability to store electricity—there could be no question that we would generate most of the heating energy required in the form of gas, and there would be no justification in the great majority of cases for the use of electricity for heating. There were cases where very accurate control of temperature was required, such as in a scientific laboratory, where electricity had advantages, but

these were very small uses, and personally he could not see much justification, except on this question of load factor, for burning coal at a power station, generating electricity, and sending it out over a mile or two of wire and then converting it into heat at the other end.

Dr. MARGARET FISHENDEN suggested that the simplest way of looking at this matter was that from the initial coal consumption there was 20% efficiency in the generation of electricity, and she preferred to think that there was 50% efficiency with gas, because out of 100 therms of coal it was possible to get 25 therms of gas and 50 therms of coke, so that one was only using 50 therms of coal, making 50% efficiency of gas generation. Hence for the same initial coal consumption electricity had to be five times as effective as coal and 2½ times as effective as gas. On a cost comparison, the discrepancy was still greater between coal, gas, and electricity. Taking coal at an average cost of 45s., gas at 9d. per therm, and electricity at 1d. per unit —which figures could, of course, be corrected—on that basis of cost gas cost five times as much as coal and electricity about fifteen times, which showed what a very long way electricity had to go to be able to compete with coal or even with gas. At one-third of a penny per unit electricity cost very much the same as gas. In some cases, however, the discrepancy could be counter-balanced or over-balanced by increased efficiency, although in other cases it could not be. Generally speaking, it was impossible to give any general solution, but perhaps for heating the greatest advantage of electrical appliances was portability.

Distribution of Heat.

The question of the distribution of heat was an aspect which had not been given anything like the prominence it should have. It was mentioned in the Paper that many heating appliances gave a uniform distribution of heat over the room, but a more important point was the distribution of heat over the human body. It did not follow that because two heaters gave the same total amount of heat that they would be anything like equally comfortable. It was well known what happened in the case of a high-temperature heater of very small area when the weather was very cold. The result was that getting near to the heater meant that only a very small part of the body was heated, and that was heated too intensely. This led to the question of whether intermittent heating by appliances such as gas and electric fires could ever be really comfortable; and from that point of view Dr. Fishenden suggested to designers that there was something wrong about the shape and size of the fire. In very cold weather, an intermittently heated room had very cold walls and it was not possible by the application of scorching heat to about 1 sq.ft. of the body to produce what could fairly be described as comfortable conditions, and there were two reasons why the open coal fire was comfortable. One was the gradual heating up of the room, which meant that less intensive radiation sufficed for comfort, and the other was the gradual heating up of a large area surrounding the actual fire itself, which meant that the distribution of the heat radiation was a very much better one on the actual body.

Mr. ROGER T. SMITH emphasized the importance of ventilation in all space heating problems and said that this had been entirely neglected in the case of many modern flats and offices which were heated electrically. Some electrical engineers, either inspired or goaded on by architects, had closed up grates and chimney openings in existing buildings and had excluded them from new designs, and they had gone so far as to boast of having saved the cost of chimneys and flues. Fresh air, however, was as essential for health as warmth, and even if there was no fire in a grate, the chimney was one of the best ventilators it was possible to have. From that point of view, instead of the 50% loss of heat in a gas fire going up the chimney being counted against it, this fact was, indeed, one of its great advantages over electric heating. His own personal view from experience was that ideally no one form of heating was sufficient, and that warmth combined with ventilation was necessary, this involving a flue.

Mr. STEPHEN LACEY (Gas Light and Coke Company) said the background of the Paper was clearly the competition between gas and electricity, and most people would agree that this rivalry had applied a stimulus that had been largely responsible for the great advances made during recent years in the design and efficiency of both gas and electrical appliances and in service to the public in other respects. Although the author in the last page of his Paper came to the conclusion that it would be a great advantage to both industries, and not less so to the public, if the two were amalgamated, that subject was obviously unsuitable for discussion at a technical meeting. The most important criticism he had to make of the Paper generally was the frequent reference made to comparative danger, and he considered this showed a grievous lack of proper perspective. The figures quoted of accidental deaths due to gas and electricity and of gas suicides showed how misleading figures might be if isolated from their context. Although the author—quite gratuitously—quoted the number of suicides by gas poisoning, he did not mention the many alternatives open to suicides such as drugs and disinfectants, hanging, drowning, &c. Again, if the deaths due to accident by gas or electricity were expressed per million consumers instead of per million of population, it would bring the two figures very close together. Further, if one turned to the Registrar-General's records it would be found that nine times as many people met their death by accidentally falling downstairs or elsewhere in the house than by accident due to gas or electricity. The truth was that the use of either gas or electricity was remarkably safe and that such accidents as did occur were generally due to badly designed or improperly installed appliances, which both industries were doing their best to stop. Further, he made the most emphatic protest against the statement in the Paper that the use of gas gave rise, along with heat, to the emission of products of combustion which were mainly of a deleterious character. As a general statement that was quite untrue. The author must know that the products of combustion of gas were almost entirely carbon dioxide and water, and that the great majority of gas appliances were, and always had been, used without a flue and without ill-effect. There were millions of people to-day using gas for lighting and, incidentally, heating their homes, and the suggestion without producing any supporting evidence that there was something deleterious in this was, to put it mildly, quite unjustifiable.

False Economy.

He agreed with the author when he said that the hygienic condition of a room was greatly improved by adequate ventilation, though personally he would put it more strongly than that. The provision of properly proportioned ventilating flues was in general practice the most satisfactory way of ensuring the adequate ventilation of living rooms, and there could be no doubt that the modern tendency to build flueless rooms was retrograde and a false economy. An air brick was not an effective substitute for a ventilating flue.

Continuing, Mr. Lacey said he was frankly puzzled to know what to make of the figures given in the Paper relating to the capital cost of production and distribution. It was stated that a gas main generally cost from three to five times as much as a buried electric cable and ten to twelve times as much as electric cables suspended overhead. One would naturally conclude from this that the distribution capital charge per therm was very much higher with gas than with electricity, whereas, as a matter of fact, the reverse was true. In the case of the Gas Light and Coke Company, for instance, the distribution capital charge for gas sold was well under 1d. per therm. On the other hand, he believed he was right in saying that the average capital charge per unit of electricity sold was in the neighbourhood of ½d., which corresponded with 1s. 2½d. per therm. Therefore, he would like the author to explain that discrepancy. Elsewhere in the Paper it was stated that the ½d. included other things than capital charges which were put at ½d. but that represented 7½d. per therm. It would be interesting, however, to know how the author arrived at his conclusion.

With regard to the cost of production, the author gave 6·1d. per therm as the gross cost of gas at the works, and 0·323d. per unit as the corresponding cost of electricity. This comparison, however, could not be right, because the average price of gas to the public was only about 9d. per therm and in some parts of the country it was less than the figure given by the author for the average cost. He could understand the author's difficulty in giving significant figures of cost, because they were greatly affected by load factor and overhead charges. That fact was commonly recognized in regard to the supply of electricity, but it also applied to the cost of supplying gas, in a lesser degree, and that was why some gas undertakings had adopted block rates or two-part tariffs as an alternative to the ordinary flat rate. A previous speaker had suggested that the reason for two-part tariffs for electricity was the fact that electricity could not be stored; but, of course, that was not the reason. The best known two-part tariff was that of the Post Office, where the question of storage did not arise. The real reason for the two-part tariff was the overhead charges which had to be covered, and such tariffs appeared to him to be quite equitable and economical, both for the supply undertakings and the public, provided the disparity between the flat rate and the lowest charges did not become unreasonably large.

In conclusion, Mr. Lacey said that while he was sorry to appear ungrateful to the author for the great trouble he must have taken in the preparation of this Paper, it must be remembered that the acceptance of a Paper by the Institution of Civil Engineers gave it a currency and an air of authority which might or might not be justified, and that was specially important when, as in the present case, technical and commercial considerations were so closely associated.

Theoretical Comparisons.

Mr. J. I. BERNARD (Electrical Development Association) said that reviewing the Paper as a whole he rather gathered the impression that the author had in some places fallen into the familiar trap presented by academic or theoretical comparison of heating costs based on the potential heating values of gas and electricity, as distinct from practical working figures. At the same time, the author's personal experience had enabled him to extract himself from such alluring theories and to give final comparisons under each heading stating practical equivalents. It was unfortunate, however, that the final Table in the Paper which could be read—and indeed had been read—as a final summary of these conclusions, did not give these practical equivalents. With regard to cooking, for example, the conclusion was clearly that electricity at 0·7d. per unit was equivalent to gas at 10d. per therm but in the Table various figures were given ranging from 0·51d. to 0·6d. With regard to the cost of producing gas and electricity, one point which should be emphasized was that the coal used in the gas and electricity industries was very different, and a very much cheaper grade was used for the generation of electrical energy. This was of importance from the point of view of coal conservation, because the coal used by the Gas Industry was obviously exhausting the coal resources of the country to a much greater extent, and any analysis in this connection should be done in terms of the useful service obtained. If that were done it would be seen that

five times as much coal was used in making gas for lighting as was used for making electricity for lighting, of equal candle-power.

Referring to the figures in the Paper relating to lighting, Mr. Bernard suggested the author might have taken some more representative and up-to-date figures. Independent tests of some of the latest gas burners showed consumptions in the neighbourhood of 48 B.Th.U. per spherical candlepower-hour, and the smallest size electric lamp—60 watts—was 12½ lumens per watt. In the light of these figures the Paper seemed to be optimistic with regard to gas and pessimistic with regard to electric lighting. Furthermore, the Paper was not up-to-date with regard to some of the more modern electric discharge lamps. For instance, the sodium lamp was said to give 20 lumens per watt but lamps had been in commercial production for some time giving 70 lumens per watt.

The cost of electricity for domestic purposes had been reduced by more than 50% in the last ten years and to-day the large majority of people could purchase electricity for heating and cooking at ¾d. per unit or less, and at this price electricity was as cheap as gas at 10d. per therm.

Lord PENTLAND commented on the fact that the Paper was of necessity a comparison as at a certain date and took no account of the trend in relative prices of the two fuels. During the past few years substantial progress had been made in the efficiency of generation, distribution, and application of electricity, and assuming that this state of affairs continued during the next few years, the comparison in the Paper would be modified considerably in favour of electricity. An outstanding example of such a modification would be if the heat pump cycle were adopted generally as a heating process. Further, any substantial increase in the price of coal might be expected to involve a larger increase in the cost of gas than in the cost of electricity, particularly if the demand for gas residuals was fairly elastic.

A State of Philosophic Doubt.

Mr. R. GRIERSON expressed regret that the author, who had been investigating this question for such a long time, still seemed to be sitting on the fence in a state of philosophic doubt regarding the merits and demerits of the various heating agents. It was to be hoped, therefore, that this discussion would clarify his thoughts and enable him to leave the meeting with his mind quite made up on the subject—and perhaps the agent which it might be anticipated the author would adopt in the future need not be specified. Commenting on the statement that the thermal efficiency of electric generation was of the order of 20 to 25% Mr. Grierson pointed out that Barking and several base load stations are now operating at efficiencies of 28½%, and undoubtedly even better figures would be obtained shortly.

Mr. W. W. NOBBS said he agreed with the author in his views as to the fundamental differences between gas and electricity as agents for heat production. Indeed, on the cost of equipping buildings he felt the author had been lenient in putting the cost of installing electricity at three to five times that of gas. His own experience was that the higher figure was nearer the mark.

Mr. C. A. MASTERMAN (Gas Light and Coke Company) said he had not come prepared to discuss the æsthetics of electric pylons and gasholders nor whether or not electric supply cables were wholly invulnerable to bombs and shells of all sizes. Criticizing the Paper, he said the author made repeated references to an imaginary low efficiency of gas appliances which was variously attributed to heat losses in the flue, inadequate insulation, ventilation of the room, and other causes. The intention of the Paper, presumably, was to compare gas and electricity for equivalent service, and many of his own criticisms of the Paper arose from his disagreement with the assumption on the part of the author that he was setting out equivalent service conditions. As between gas and electricity there was no need for, nor was there any contrast in, the degree of insulation—the only essential contrast being that a gas appliance must vent its products where an electric appliance, in some circumstances, could remain sealed. The significance of the heat loss from a gas appliance due to this venting, however, was greatly decreased owing to the technical developments of the last few years. Heat loss from the flue of the ordinary domestic gas oven was now approximately half what it was a few years ago and was a fraction only of the loss through the lagging which was common in character whether the cooker be gas or electric. It was interesting to remember that designers of electric cookers now appreciated the need for venting the oven in the interests of good cooking, and with modern cookers for equivalent cooking service the loss of foodstuffs being cooked showed no substantial difference whether gas or electricity be used. The author also stated, with regard to electricity, "by its agency pure heat energy can be delivered through flexible wires in any quantity," but that claim the electrical engineer would be the first to contradict, since it was this limitation which, after price, was one of his greatest handicaps.

In connection with water heating the commonest application of gas was by means of an instantaneous water heater, a system inapplicable in the case of electricity since it would involve a loading of the order of 25 kW. Similarly, the relatively slow operation of the electric hotplate was partly due to the limitations in loading corresponding to not much more than half the heat energy in a normal gas ring. Even so, the switching on of all the elements of an electric cooker corresponded to bringing into simultaneous operation more than twenty electric lamps. By turning down the gas to correspond to the heat input of an electric hotplate increased efficiency was, of course, obtained, but most users valued the opportunity of speedy operation even at a slight increase in gas consumption. The author referred to the use of gas geysers as involving considerable risk of accident, a claim or threat which could in no way be reconciled with the many tens of thousands of these appliances in daily use. Mention was then made of carrier current control as being peculiar to electricity; indeed, the author stated that gas was, in its nature, unsusceptible to anything resembling this control. Obviously, the author was unfamiliar with the fact that the City of Berlin, among a number of others, was largely lighted by gas, all of which was under pressure wave control.

The Life of Gas Mantles.

Speaking of the life of mantles, Mr. Masterman said the author would no doubt be interested to learn that in the case of the Gas Light and Coke Company, which reported a substantial addition last year to the number of street gas lamps, the average mantle life was not 350 hours, as mentioned in the Paper, but over 1,000 hours, and, moreover, in selected cases mantles had been found to give full light value after 8,000 hours. Speaking of pilot lights, which the author stated burned upwards of 1 cu.ft. per hour, Mr. Masterman said in practice the normal rate for a pilot was of the order of ½ cu.ft. per hour, and recent developments in pilot design suggested an even lower consumption could be obtained without prejudice to stability.

The author's calculation of equivalent prices for gas and electricity for water heating appeared to credit gas with a heat transfer efficiency of under 60%, representing an error of about 20% in the author's estimates. Outside the difference between gas and electricity in heat transfer efficiency, there was no reason for any contrast in operating efficiency. Would the author explain his statement that "A gas heater cannot be so perfectly insulated as an electric heater." Moreover, the reference in the Paper to "fur deposition" as being responsible for substantial reductions in efficiency in the case of gas water heaters was not supported by experience. Moreover, in his own experience, the author's claim of 10d. per therm as equivalent for water heating to 0·7d. per unit was approximately 50% in error. The equivalent figure for electricity had been found to be well under 0·5d. per unit.

Continuing, Mr. Masterman said the author's comparison of the two heating agents for room heating appeared especially to invite the criticism that he was comparing unlike services. If he was content with stuffy room conditions due to inadequate ventilation, then gas comparisons must be based on flueless electric heaters against flueless gas heaters. It would then be found that the electric equivalent of gas at 10d. per therm was about one-third of a penny per unit. He imagined, however, that most people would agree that such a form of heating was less than ideal.

Flues and Ventilation.

The Paper contrasted the ventilation from an ordinary 9 in. by 9 in. flue with the smaller types of proprietary flues used for gas fires, but the dimensions of these were 12 in. by 2 in. or 15 in. by 2½ in. and not 10 in. by 2 in. as stated in the Paper. A very complete series of tests and calculations with such flues led to the conclusion that for a 30 ft. chimney a 9 in. by 9 in. flue with 5 in. chimney pot would give 7,000 cu.ft. of additional ventilation; a 15 in. by 2½ in. flue would give 6,000 cu.ft., and a 12 in. by 2 in. flue nearly 5,000 cu.ft. The author appeared to suggest that the ventilation in the former case was wholly excessive whereas in the latter case ventilation was "negligible." In his own view, however, such an order of ventilation was calculated to meet normal requirements, and the contrast between large and small flues. Again, Mr. Barker assumed with a gas fire an air exchange of 10,000 cu.ft. per hour, for the heating of which air he wished to make an allowance of 25 cu.ft. of gas. Such an allowance, however, would lead to a temperature rise in the air such as to exceed 60° F. and would be utterly intolerable to the occupants of the room. The author's tables derived on this basis of calculation appeared to him wholly misleading, and indeed, the principle from which they were derived was, in his view, false, since the warm vitiated air passing up the chimney had already served its purpose and on hygienic grounds it was desirable to remove it from the apartment.

Finally, Mr. Masterman stated that the author's reference to cooking and the estimate of 0·7d. per unit for electricity as being equivalent to gas at 10d. per therm, was approximately 50% in error, and he suggested the author had not made himself familiar with the developments in gas cooking during the last few years or conceivably had exaggerated to this degree what he imagined to be the developments in electric cookers. The same type of somewhat irresponsible estimate must also be regarded as controlling the reference in the Paper to gas and electric furnaces, judging by the broad statement that "the outside of an electric furnace is cooler than that of a gas-fired furnace." In that connection he assured the author that his statement that developments in furnace design and otherwise were handicapped by unwillingness on the part of the gas or electricity industries to take advantage of the facilities provided by the other was quite untrue. The Paper, concluded Mr. Masterman, was of a type unusual to the Institution of Civil Engineers and therefore it had seemed to him the more necessary to draw attention to an undue number of apparent inaccuracies and to the possibility of the Paper creating false impressions detrimental to the two great industries involved.

[There was no time for the author to reply to the discussion at the meeting.]

Heat-Resisting Glassware

WITH SPECIAL REFERENCE TO TESTS FOR QUALITY

Mr. Dunkley, who is Officer-in-Charge of Stores Testing of the Gas Light and Coke Company, presented this Paper to a meeting of the Illuminating Engineering Society in London on Feb. 11.

by
S. F. DUNKLEY

It is desirable in prefacing the subject to point out that certain physical properties, such as tenacity, elasticity, expansibility, and what is possibly more important, thermal endurance, which term is recognized as representing a combination of several factors, indicate very definitely the degree and rate of heating and cooling to which the glass may be subjected without danger of fracture.

Most modern heat-resisting glasses are of the boro-silicate type, and since the war the increased availability and the fall in price of boric oxide has made it commercially possible to use it in the manufacture of heat-resisting glass, with the result that many new types of glass have been produced.

Physical Properties.

It is essential that illumination glassware should be capable of withstanding the mechanical and thermal shocks to which it is subjected during normal life. These shocks are occasioned by rough usage, trucking, washing, sudden heating and cooling, draughts, rain, and numerous other factors.

(i) *Mechanical Strength.*

The mechanical strength of the glass is its ability to withstand mechanical shocks, and is dependent on the elasticity and tensile strength. Hardness gives resistance to scratches and surface disfiguration, and is also of importance.

(ii) *Durability.*

By durability is meant the power of the glass to maintain its quality without undue deterioration, as shown by filming or clouding, sweating or pitting, discolouring, and other faults mentioned under Defects, and could, perhaps, be better described as wearability. Glass may have to be capable of resisting atmospheric conditions, dust, water, aqueous solutions of salts, alkalis, and acids.

(iii) *Thermal Endurance.*

The thermal endurance of the glass, that is, its ability to withstand thermal shocks, is dependent on the following characteristics:

(*a*) Tensile strength.
(*b*) Elasticity.
(*c*) Coefficient of linear expansion.
(*d*) Specific heat.
(*e*) Coefficient of heat conductivity.
(*f*) Density.

Defects.

From observation of the behaviour in use of lighting glassware, defects appear to fall under the following general headings:

(1) Breakages due to:
(*a*) Poor design.
(*b*) Unsuitable composition.
(*c*) Accidental manufacturing faults.
(*d*) Initial strain unrelieved.

(2) Durability (wearability) due to:
(*a*) Filming or clouding.
(*b*) Sweating or pitting.
(*c*) Discoloration.

It is obvious that in any one failure all can be contributing in a lesser or greater degree, and some reference to each may be useful.

(*a*) *Poor Design.*

Unsatisfactory results from globes designed with sudden and unnecessary changes in profile and big differences in the thickness of section were familiar years ago, and lighting bowls and globes are still to be found which can be, and have proved to be, very dangerous in use, although fortunately they are much less frequently encountered than in the past.

(*b*) *Unsuitable Composition.*

(*c*) *Accidental Manufacturing Faults.*

The user is entirely in the hands of the specialist and the manufacturer in this connection, and good results would appear to depend largely upon the knowledge and skill of the manufacturing staff and amount of supervision employed. In fairness to the English manufacturers it can be said that in the past little encouragement was given to them owing to the general acceptance of cheap foreign glassware and the fact that insufficient data were given to them as to the real conditions and requirements of use. Statistics of behaviour in use are costly, sometimes difficult to collect and analyze, and the user was apparently unaware of the large saving which could be effected in maintenance by paying a higher price for a globe specially designed for the conditions it had to meet.

The following statistics in relation to a large sign of the Research Laboratories of the Gas Light and Coke Company may be of interest. The position is a very exposed one, being on the south side of the Thames and facing the Chelsea Embankment:

Length 120 ft. Depth—sides 8 ft. 6 in., middle 13 ft. Height above water 70 ft.

19 7-mantle superheated lamps (8,750 B.Th.U./hr.).
8 9-mantle superheated lamps (11,250 B.Th.U./hr.).
Distance of lamps from facia 4 ft. 6 in.

The chart (fig. 1) shows the breakages of mantles and globes on this sign over a period of six years.

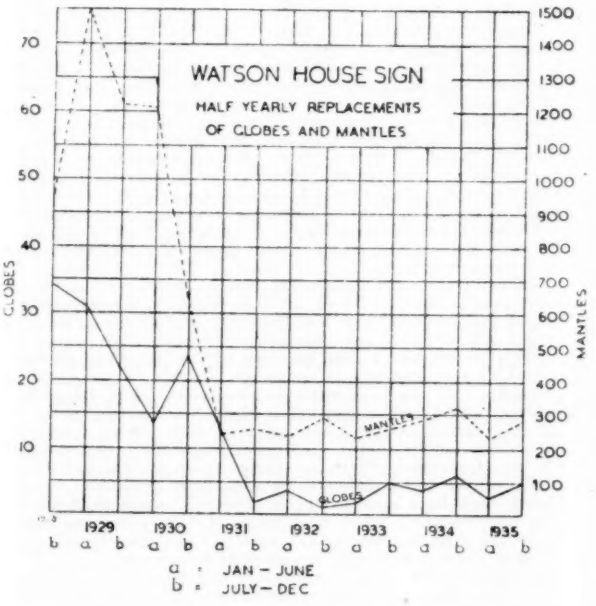


Fig. 1.—Records of Replacements of Globes and Mantles for Sign Outside Watson House, Visible from Across the Thames.

The sign was brought into lighting during the first half of 1928. Owing to the very severe atmospheric conditions, breakages of glassware and consequently breakage of

mantles was very high and resulted in high maintenance costs and poor appearance of the sign. All possible means were tried to reduce this, constructional details of the lamps being modified and a variety of types of globes experimented with. No very definite improvement was noticeable until after 1930, during which a leading manufacturer of heat-resisting glassware experimented with and finally produced a globe of outstanding thermal endurance with the very satisfactory results shown. It may here be stated that since the adoption of this high quality heat-resisting glass no case of breakage has occurred while the lamps have been in use, all breakages being due to handling during maintenance and cleaning.

(*d*) *Initial Strain.*

This is the result of poor annealing, and it is safe to assume that all manufacturers of repute thoroughly understand this problem. It is sufficient to say that the presence of strain in glass can be detected by means of polarized light, and that the majority of manufacturers employ some type of optical instrument such as the strain viewer, or polariscope, working on this principle. Individual failures out of bulk supplies are therefore presumably due to unavoidable manufacturing errors.

(*e*) *Poor Wearability.*

Information still appears to be lacking as to what can be considered to be a reasonable length of life for lighting glassware under normal conditions of use. It seems evident that with time deterioration does take place and good quality glass will fracture after months of use for no apparent reason.

Filming and discoloration are often apparent after a short period in use, and it has been suggested that in addition to unsuitable composition of the glass the trouble may be partly due to the composition or finishing treatment of the metal holding or containing the globe.

Statistics of Replacements.

It is very difficult for obvious reasons to obtain reliable figures and distinguish between replacements of glassware due to poor thermal endurance, breakage due to handling, and failure due to poor durability.

Figures available in respect of the highest quality heat-resisting glass tend to show that practically all breakages are due to handling during maintenance, and that with experienced labour, working under such difficult conditions as public lighting, a reliable replacement figure is in the order of half a globe per lamp per annum. Difficulties of handling large globes of very thin section in awkward positions and under trying conditions will be realized, and this figure is a very reasonable one for public lighting.

High temperatures make difficult the increasing of mechanical strength by the reduction of globe size and increased thickness of glass, and it is presumed that this is realized by both glass and lamp manufacturers. It is felt, however, that further co-operation and investigation on this matter could be made with advantage.

Breakage in transport is also an important item, but methods of packing have so improved in recent years as to suggest that more care in the handling of the receptacles containing these fragile globes could be taken.

Control of Quality.

As the result primarily of competitive buying and selling tending to reduce prices and quality, safeguards to both manufacturer and user become necessary. These safeguards usually take the form of specifications and agreed standard tests.

Up to very recently the number of National Standard Specifications for the various uses of glassware has been very limited, and it is significant that the first specifications produced were for those uses demanding the highest quality.

With the gradual increase in efficiency of gas and electric lighting units, low pressure, superheated, and high-pressure gas burners, carbon filament, metal filament, and discharge tube electric lamps has come also a steadily increasing temperature in the vicinity of the light source, demanding with each increase in efficiency glassware with a higher degree of thermal endurance. Until comparatively recent years no engineer would take the risk of fixing an outdoor lamp under which the public had to pass without safeguarding himself against possible accidents due to fracturing of the globe. The form of protection used was usually a thin wire net around the outer surface of the globe. With all the complexities of glass manufacture and the difficulties involved, manufacturers can be congratulated on their efforts in recent years towards producing heat resisting glassware of such a high standard. The author looks forward to still closer co-operation between the manufacturers and the users with a view to making it easier for the merchant and user to distinguish between satisfactory, indifferent, and poor heat-resisting glass.

Tests.

The only tests in which the user is likely to be interested so far as heat-resisting glassware is concerned would be for:

(i) Wearability, and
(ii) Thermal endurance,

and the author is unaware of any national specification which provides for both of these.

(i) *Wearability.*

Various widely-used tests exist and give some indication of the probable behaviour of the glass after prolonged exposure. All these tests are based on the resistance offered by the glass to various reagents and under various conditions, and the most widely used are:

(1) *Powder Test.*—In this test the glass is ground to powder and is then subjected to hot water under known conditions, the amount of solid dissolved being taken as a measure of the durability. This test is based on the fact that most glass is attacked by H_2O, and some alkali is dissolved out.

(2) *Iodeosin Test.*—The glass is immersed in a saturated solution of water in ether, to which a very small quantity of iodeosin has been added. The water attacks the glass, and a small quantity of alkali is set free, which combines with the iodeosin to form a red alkali salt. This is insoluble in ether and is deposited upon the surface of the glass, the red colouration indicating the amount of alkali set free, and the wearability of the glass being judged by the intensity of colour.

(3) *Autoclave Test.*—The glass is subjected to the action of water at temperatures of 150° C. or more, the necessary temperature being obtained by heating the glass in an autoclave. In this test not only is the water considerably above normal boiling point, but the pressure is correspondingly high.

(4) In addition to the above, *numerous other tests* exist, such as estimating by the resistance to solutions of acids, alkalis, and salts, such as ammonia solution, dilute sulphuric acid, sodium carbonate solution, &c.

It is hoped that more information will be obtainable as to the possible more general adoption of some simple test which can be easily applied.

(ii) *Thermal Endurance.*

After extended discussion and experimental work on the part of the manufacturers and the research laboratories of the General Electric Company and the Gas Light and Coke Company, the test clause for thermal endurance of B.S.S. No. 324 of 1927 was again, as a temporary measure, modified so as to apply to glassware for indoor lighting units under normal conditions of use. The modified test clause, as it appears in B.S.S. No. 324, 1934, reads as follows:

"The glassware and the canopy shall be so designed in relation to each other that the glassware shall withstand the following test without fracture or other injury:

"After operation for one hour in normal working conditions, the light source shall be extinguished and the whole fitting or the glassware alone (whichever shall be mutually agreed by the parties using this specification) shall be plunged, after a lapse of time of 45 seconds, into water at a temperature of 55° C., the immersion being completed within a further 5 seconds.

"Clamping screws or similar devices shall be slack throughout the test.

"*Note.*—It is pointed out that it is impossible to formulate a satisfactory acceptance test for the thermal endurance of lighting fittings for use under all conditions. The test described above is designed for interior lighting fittings under reasonable conditions of use."

The rates of normal heating-up and cooling-off vary with the type of globe under consideration, but in every case the action is greatest during the initial stages. However, it must be remembered that during the thermal endurance test the globe is cooled off completely in five

seconds, and it is thought that the table shown below is of some interest, since it indicates the relationship between normal cooling off and that encountered during quenching.

TABLE I.

Type of Globe and Lamp.	Normal Rate of Heating Up. °F./Min.	Normal Rate of Cooling Off. °F./Min.	Rate of Cooling Off During Test. °F./Min.	Class of Test. (See Next Table.)
Globe for 1,000 C.P. (nominal) high-pressure lamp . . .	145	112	6,900	A
Pear-shaped globe for 5-mantle superheated low-pressure lamp	90	65	4,008	B
Bell-shaped globe for domestic low-pressure burner . . .	44	40	1,236	C

NOTE.—The rates of heating up and cooling off have been based on the temperature increase or decrease over the first two minutes, at the point on the globe where the highest temperature is reached.

Clearly, the test is a very stringent one and should form a reliable guide, but that it is not too severe will be understood when it is realized that in practice in winter even more extreme conditions may be met. On any glassware there are large temperature differences at various points and that generally the glassware is hottest at the point nearest or above the source of illumination.

At first sight it might appear reasonable to suggest that according to which part of the glassware (the hottest or the coldest) is first immersed, so the rejection or acceptance would be affected. This has so far not affected the result in practice, presumably owing to the tendency of the glassware rapidly to equalize in temperature during the time lapse.

It appears that by varying the shape and size, the distribution of temperature can be controlled to some extent, and that by increasing the size the temperatures tend to decrease. However, since all shapes of globes for any one type of lamp have the same neck diameter, the maximum temperature does not vary greatly, and satisfactory temperature distribution is mainly a question of experiment as to which shape is best suited for any particular lamp.

Extension of Tests.

The importance of having standard tests to classify glassware in its relation to suitability for certain conditions of use has long been realized by lighting engineers. The gas and electrical industries in their dealings with the public encounter every condition of use; for example, ordinary dwelling houses, the generally more severe conditions of public halls, the still more severe conditions in factories, and the certainly very extreme conditions experienced in street lighting and the outside illumination of buildings.

The National Test as it now exists, although developed to cover possibly the largest category of use, does not go far enough. From experience in the application of the test it appears to be satisfactory only for heat-resisting glass suitable for use in domestic houses and public buildings, where no extreme conditions might be experienced, whereas in practice certain interior lighting fittings are very definitely subjected to conditions which are as severe as those met with on outdoor lamps.

During 1935 the Gas Light and Coke Company issued well over a quarter of a million items of glassware for a very wide range of types and sizes of units and conditions of use which is possibly only a small proportion of the actual number sold on its area.

As a result of many years' experience in the investigation of failures, and after considering the results produced in the application of these tests, the author feels that an effort should be made to classify glassware under three headings:

"A" Quality.—For the most extreme conditions—i.e., for use on lamps of very high temperature, such as high-pressure gas lamps, electric lamps, multiple superheater low-pressure gas lamps.

"B" Quality.—For the less severe or normal conditions of use, such as indoor electric units, low-pressure gas lamps and burners, and burner units.

"C" Quality.—For the purely decorative illumination glassware of the variety that has a large sale but does not really fall under the category of heat resisting, but which nevertheless is satisfactory, providing care in use is exercised, and it is not exposed to sudden and severe draughts.

If this were agreed to, it is suggested that the three tests shown in Table II. would be suitable, and indeed are being found suitable, to distinguish between these three classes.

TABLE II.

Quality.	Period of Operation.	Lapse of Time Between Extinction and Immersion	Temperature of Water.
A	1 hour	30 sec.	10° C. (50° F.)
B	1 ,,	45 ,,	55° C. (131° F.)
C	1 ,,	90 ,,	100° C. (212° F.)

Test A.—This is the original B.S.I. test, and manufacturers need have no misgivings as to the severity of the test, since the high quality of modern heat-resisting glass for this class of work gives them a large margin of safety and puts the glassware in a distinct class.

Test B.—This is the present B.S.I. test, and from practical use of the test it has been found to give the manufacturer and user a line of demarcation between glassware that will be definitely satisfactory in use under *all* conditions normally encountered with this grade of glass and that which is less satisfactory.

Test C.—This was developed at the research laboratories of the Gas Light and Coke Company, at Watson House, to deal with the several types of glassware, often of intricate shape and of special manufacture, used for household lighting. This cannot in the true sense be regarded as in the heat-resisting class. The public are naturally attracted by the decorative appearance of this type of glassware, and generally realize from experience that some care must be exercised in the use of it. It was found that some test was necessary to ensure that a reasonable life could be expected. Glassware of this class is invariably used for both gas and electric units, and although the test is very mild it gives a measure of security to manufacturer and user, particularly in the case of use with gas units where higher temperatures are encountered.

It is felt that the adoption of these three tests would immediately enable manufacturers and users to classify glassware and lighting units and relate them to temperature and conditions of use, and therefore prevent difficult disputes as to failures of glass in use.

Discussion.

In opening the discussion Dr. HAMPTON said that in his opinion the pink colouration was due to the copper of the fitting fusing into the globe and this was more particularly so in the case of the high-pressure gas lamp. Regarding the tests, he said that the manufacturer could not guarantee glassware to stand up to any specification unless the conditions of the test were strictly set out.

Mr. F. C. SMITH (Gas Light and Coke Company) said he was very surprised to hear the view that pink coloration was due to the copper fusing with the globe. He did not deny that the heat was sufficient to cause a change of state, but he did not think that Dr. Hampton's statement was correct. He thought that the improvement in heat-resisting glassware was extraordinarily good, and, to-day, breakage had been reduced to an almost negligible quantity; and the Gas Industry was indebted to the glass manufacturers for this improvement. Having had considerable experience with regard to street lighting, he had found the test very useful for differentiating between various glasswares.

Dr. S. ENGLISH said that it was twenty years since he first tackled the question of thermal endurance; and he thought that a very important matter that was omitted in the Paper was the question of heat absorption.

Mr. CUNNINGTON wondered what conditions it was sought to reproduce in the tests. One cause of breakage was the impinging of heat on one particular spot. He asked if the globe broke as a result of the impinging of a flame on a part of it, or did the mantle break as a result of exposure to the weather on the failure of the globe. He went on to suggest that the impinging of a small flame might be included as a further test for glassware.

A MEMBER said that as a result of a number of tests he had carried out recently he found definite evidence of the weakening of the glassware due to repeated bathing.

Another MEMBER drew attention to the fact that most of the contributors to the discussion had lost sight of the real object of the tests, which was to separate the wheat from the chaff.

The Author's Reply.

In his reply to the discussion, Mr. DUNKLEY agreed with Mr. Cunnington that the real object of the tests was to differentiate between good, bad, and indifferent glassware. The importance of this would be fully appreciated where large quantities of glassware were being purchased. The breakage of globes was certainly not due to the failure of the mantle; and even in the case of high-pressure gas lamps, breakage was not due to the flame impinging on the glassware. Of course, once the globe was broken, then the delicate fabric of the mantle was exposed to the weather and sometimes failed.

The Commercial Gas Company

The Annual Ordinary General Meeting of the Company was held at the Abercorn Rooms, Liverpool Street Station, London, E.C., on Thursday, Feb. 20, 1936—DR. CHARLES CARPENTER, C.B.E., M.Inst.C.E. (the Chairman), presiding.

The GENERAL MANAGER AND SECRETARY (Mr. F. J. Bradfield) read the notice convening the meeting, and affixed the Company's seal to the Register of Stockholders.

The CHAIRMAN: Ladies and Gentlemen,—In accordance with the usual practice, I presume it will be your wish that the report and accounts, of which copies have been in your possession for some time, shall be taken as read.

I realize that the paragraph in the report which above the others must have set you thinking, and which is, I suppose, after all, the one providing the best key to the progress or retrogression of the Company, is that wherein a final dividend is recommended at the rate of only 2½%—in other words, that you should be paid for nothing more than the use of your money, which payment has been settled by Act of Parliament at 5%, and nothing in return for skill in management, to which you are certainly entitled by the efforts of your officials and your employees. I hope when I have finished my remarks that I shall have given you ground for belief that there is something of a silver lining contained behind the dark cloud of our report. At any rate, I am sure that when I have put the facts before you, you will agree with my colleagues and myself that a higher rate of distribution is not justified at the present time.

A Simile.

It is now six years since I accepted the position of Chairman of this Company, and although I can claim something to the good as a result of the attention I have given to the Company's affairs, I feel somewhat in the position of the captain of a ship whose pumps have proved below the capacity of the inroads which rougher passage have made on its stability. Before I go further, let me say that, while I do not fear the future, I am convinced that we need more modern machinery to combat the increase of bad weather to which we are now subjected. Those of you who have followed my remarks, and have studied the accounts each year, will have realized that the quantity of gas sold has been a decreasing quantity, and our revenue each year has been thereby affected. This reduction has, of course, been gradual, and its effect on receipts is also due to increased discounts given to industrial users. Naturally expenditure on our raw material, coal, has decreased in proportion and savings have been effected on other items of expenditure, but it becomes increasingly difficult to reduce overhead charges when a smaller average quantity of gas is taken per head by our consumers in each successive year.

To some extent it is satisfactory that the Gross Profit is substantially more than for the previous year, but it must not be overlooked that that one—1934—was in itself not a good one, as it showed a deficit of over £20,000.

In the circumstances it was unanimously decided to recommend a final dividend of 2½% only, which, as shown in the inset of the Net Revenue Account, will require a payment of £44,373, and thus leave between six and seven thousand pounds to be carried forward to the current year's account.

There are several reasons for the reduced sales of gas and the consequent cash receipts, but there is little doubt that during the last two years we lost more, for other reasons than those originating in changes in weather and social habits. There are three Municipal Electricity Undertakings supplying current within the Company's area, and they are all obtaining more customers and, therefore, a larger output. As they, too, are not permitted to supply outside their boundaries, so it is clear that such additional output must, very largely, be by the displacement of gas.

Municipal Competition.

As compared with other gas undertakings, we have no virgin soil to exploit, and while it is true that proportionately there is more slum clearance and building of working class tenements in East London than in perhaps other parts of London, it is not possible owing to the unfair restrictions put in our way regarding the gas lighting of new buildings, to secure the amount of business which we formerly had from tenants of the houses demolished.

This municipal competition is a serious menace to us, and, but for the increase in the industrial sales, our losses would have been much greater. A recently advertised Borough Council Show promises free cooker prizes, free food, and free entertainment, in an endeavour to kill off an undertaking which has carried on in its midst for over a century a well-conducted business, and as a large employer of labour. I do not know whether it will surprise you that we have not up to the present felt able to follow this example. I am not altogether sure that we ought not to have done something, but the fact remains that we have not.

The Cooker Business.

You will recollect that when I addressed you a year ago, I mentioned that black gas cookers compared unfavourably in appearance with the enamelled electric cookers, and I stated that we were rapidly replacing them at the rate of 400 to 500 per week. Here, again, our conservatism, and our effort to work with the greatest possible economy, may have been carried too far. I may refer to the difference in the engineering outlook in this country and America. Take, for example, a machine tool. The Americans will run it for all it is worth, and then break it up and replace it by a new one. In this country I have seen examples of machines which had been kept going ever since the works in which they were installed were opened. I am afraid that sort of spirit inspired us up to a year ago, but we have since been realizing the increasing importance of supplying the public not only with something that is useful, but something that has a good appearance as well. Up to the end of last year no less than 32,423 of these cookers have been exchanged, and after allowing for sales, it is estimated that there are about 37,000 more to do. We hope to complete the major proportion of these by the end of the current year, and I do not think any company, in relation to its size, has ever carried out work of this nature so expeditiously, and credit is due to the staff for the way in which they have carried out the work. The effect has been an increase in our Capital Account, but I think you will agree that the retention of the business justified the expenditure. We have not dealt with the whole of the additional expenditure on these stoves in this manner, but their improved value is, of course, a Capital Charge. As the large number handled has also increased the Repairs Cost, it would be unreasonable to expect the whole of this abnormal charge to be borne in one, or even in two, years, and we are therefore spreading it over a longer period. It was, however, no good hoping that people would go on using the old style cookers, and so we had to take the bull by the horns, and give them something better.

Greater Efficiency of Modern Appliances.

Another factor which accounts for the reduction in the gas sales is the greater efficiency of the modern gas cooker and fire, but this is a loss which the Company is quite willing to sustain. It is, of course, the fact that a good deal of the gas in cooking was, in the past, not used to the best possible advantage. In spite, however, of the improved service that gas companies give year by year, there are still some people who wrongly imagine it is in the interest of the Industry to encourage the extravagant use of gas in order to increase its business. I do not think we ever encouraged the extravagant use of gas, but we did not keep our attention on consumption as the increasing competition of to-day compels us to do.

The same wrong idea was held when incandescent mantles were first introduced. Their use was also suspected of being a ruse to sell more gas, but it is now well known how erroneous was the idea. The incandescent mantle used about 3¾ cu.ft. of gas per hour, compared with the old batswing, which consumed between 5 and 6 cu.ft., and, in addition, the mantle gave a much larger amount of light. Gas companies lost enormously by its introduction at first, but the improvement in the light, which is, without exception, still the best light for working by, helped the companies to retain, and, indeed, increase the lighting load. That load, in spite of the large amount of electricity that is used, is still a very important one to your Company, as was proved beyond any doubt by the increased output during the dark days just before last Christmas. The consumption of gas then went up very considerably, not as a result of lower temperature, but because the sky was overcast, and those who have gas lights—and there are many thousands—put them into use.

What was true of the incandescent mantle is also true of the modern cooker and fire, and the usage of these is advised and encouraged, although it is known that such sales must cause a reduced output. As I have already said, 32,000 cookers have been exchanged in the last two years (22,000 during the past twelve months), and although it is not possible to state the actual loss in consumption due to their greater economy, it will be realized that the cumulative effect of the saving has an important bearing on gas consumption.

I ought to say that other sources of business have not been neglected during activities with cooker exchanges, and during the year large numbers of additional appliances, such as fires, radiators, water heaters, and coppers, were supplied at rental or sold outright, as well as numerous other industrial appliances. With regard to the latter, it will be of interest to you to know that there was an increase in the gas used for trade purposes of nearly 13% as compared with the previous year. This is, of course, business at lower prices, but it is a very useful load, and we have every hope of its further extension. One of our largest customers has recently given an order for thirty lamps in their extended factory for illuminating purposes, after a long experience of the gas lamps we have supplied. One of their needs is a light approaching as nearly as possible to daylight, and it is satisfactory to know that the

lights we have supplied are the best for that purpose, either gas or electricity, which they can obtain.

Prepayment Consumers.

Before dealing with the Accounts, there is one other matter to which I should like to refer, and which involves an important change of policy. As you know, we have a very large number of what are known as prepayment meter installations. I think the proportion, in figures, is about four to one. As you know, in the case of these installations, the Company, at its own expense, lays the service, pipes the dwellings, and supplies prepayment meter, fittings, and appliances as required. Gas is charged at the current rate, and by Statute we are also permitted to charge up to an additional 3d. per therm for the cost and maintenance of the installation. Until June of last year, the additional charge has been 2d. per therm, but it had been quite clear for many years previously that thousands of these consumers had not been using gas in a sufficient quantity to meet the additional cost of supplying gas through such meters, one effect of which was they were obtaining gas at a preferentially low rate. On the other hand, there was a large number who, appreciating the advantages and economy of gas, were taking a quantity which resulted in their paying for more at the high rate—namely, 9d. per therm, *plus* 2d.—than they should have done. That is a defect of the prepayment system which has persisted throughout the forty years or so that have elapsed since it first came into vogue. But there, again, the increasing competition of the last few years has caused us to look more closely into matters. As a result of the competition, too, consumers themselves are looking more closely into things, and sometimes they question why they should go on paying so much, even after the original cost of installation and appliances has been fully met out of their payments. In June last, therefore, it was decided to alter the method of charge, and at the same time make the additional or accommodation charge 3d. per therm, but only *on the first* 15 *therms consumed in each collection period* of six weeks, no charge at all beyond the standard gas rate being made on quantities taken in excess of the 15 therms used in such period.

As might be expected, the smaller users, who, I might say, are not necessarily the poorer users, in some cases raised objections which your collectors were generally quite able to deal with. The one serious objection, however, came from the London County Council, by whom the suggestion was made that its tenants should remain on the old scale unless they desire otherwise. Needless to say, it was not possible to accede to the request for such preferential treatment.

I might mention that no actual monetary benefit has accrued to the Company consequent on the change, as the "smaller" user, up to the present at least, has apparently economized still further in his gas, but fairer treatment has been accorded to the larger user, who, we must hope, will now be able to supply his wants more freely.

The Accounts.

Turning to the accounts, it will be seen in the Capital Account that £28,258 5s. 9d. has been expended on freehold property, the major part, £25,358, being in respect of the Malam Gardens Estate, on which 29 cottages have been erected for occupation by the Company's employees, particulars of which I gave a year ago. The remainder is partly in respect of houses acquired to accommodate the tenants of property demolished, and partly for occupation by other employees. As I have explained before, our settled policy is now to encourage the latter, as far as possible, to live in the district of our gas supply. Owing to shortage of available accommodation—which is sometimes put forward as an objection—we are doing all we can so as to ensure that a greater number of the employees may live nearer to their work, and so be able to go home to their mid-day dinner, instead of having to wait until the evening.

There has been expended £4,719 on new and additional plant (including a waste-heat boiler), and £29,857 on new and additional stoves. From a total of £63,154 18s. 4d. there are detwo credits of £1,904 18s. for meters and of £590 2s. 1d. respectively for prepayment fittings, the net addition to capital being £60,659.

With regard to the Revenue Account, it will be seen that the sale of gas brought in the sum of £539,623. This is £21,880 less than the previous year. The difference represents more than the 2·93% reduction in gas sales, the excess over the measured quantity being due to discount on the increased consumption at lower prices of several of the more important users. Rentals are slightly more, but residuals at £174,444 brought in £9,898 less, the reduction being due to lower prices realized for tar and, to a smaller extent, by reduction in the make, particularly of coke.

On the expenditure side, coals cost less by £6,602, due partly to the smaller quantity carbonized, and partly to a larger yield per ton. The remaining items of manufacture were lower by £11,240. Distribution at £196,218 also cost less by £13,132. Rates and taxes at £37,302 were more by £2,664, but the remaining items were down by £13,446, no bonus being payable to co-partners consequent upon the shareholders' dividend being reduced to the 5% standard. The basis of working is, as you know, 5% for the use of the money, and what extra profit is in the pool over and above that is divided in the proportions of three-quarters to the consumer to go in reduction of price, and the other one-quarter shared equally between shareholders and employees. Thus, while the shareholders are asked to accept 5%, the employees are asked to accept their normal salaries or wages, without any addition for good-will and good work.

The total expenditure was down by £40,782, and the gross profit up by £11,054. The dividend at the reduced rate, *plus* debenture and other interest, amounts to the sum of £129,916, leaving a deficit on the year of the £4,306 previously mentioned.

You will have noticed the paragraph in the report with reference to an issue which has been made of debenture stock. It is quite clear that, owing to the changing conditions in the Industry, the capital requirements of gas companies per unit of sale—the therm, for example—are becoming greater than has hitherto been the case. It will be remembered that a resolution was passed at the last General Meeting authorizing the application to the Board of Trade for an increase of capital powers, and on March 27 last the Board of Trade made an Order empowering the Company to borrow, on mortgage, or by the issue of debenture stock, an amount (including any sums already borrowed) not exceeding 70% of the amount of share capital paid up.

It can be truthfully stated that your officers are having more difficult conditions to deal with than ever before. Notwithstanding the not infrequent electric "black outs"—126 in the United Kingdom in 1935—the latest being the entire cessation of supply on the electrified south-eastern section on Saturday last of the Southern Railway, caused, it was stated, by a fusion between the Deptford Power Station and the railway company's distribution centre, and fires caused through faulty wiring (there were 14 in Stepney and Poplar Boroughs last year), the supply of current still absorbs much energy from the local undertakers, and what may be described as "frantic" efforts are being made to secure some sort of cooking load. Quite a number of electric cookers have been installed—to the regret of many of the users—and it is only the liability of having to pay for the cost of fixing that prevents their removal. One lady, who, by her temporary enthusiasm, was responsible for four or five others in the same block of dwellings signing agreements for their installation, begged the Company a fortnight later to supply a small gas ring. The cooker is still installed in its ornamental grandeur, but is rarely used. Unfortunately for her and the Company, there is no space remaining for a gas cooker.

This is the first time since the introduction of the original profit-sharing scheme in June, 1901, that no bonus has been available for distribution. I and my colleagues sincerely trust the profits for the current year will justify the resumption of a dividend addition to the shareholders' interest and of a bonus addition to the employees' salaries and wages, but whether this proves to be true or not, my colleagues and I are confident that the co-partners will not be disheartened by the set-back, but rather encouraged to make even greater efforts to maintain—if possible even to extend—the Company's interest, and its service to the public.

With regard to the future, I cannot, of course, guarantee there will be no further reduction in our sales and profits, but I do believe that, given a continuance of existing trade conditions, we shall have more satisfactory accounts to present you with a year hence, although we have not yet provided for the increase in the cost of coal of 1s. per ton, to which we have acquiesced as our contribution to the agreed addition to the coal miners' wages, and amounting to nearly £12,000. We shall have to do something with regard to that, but, even so, I still believe that at the end of 1936 we shall have a more satisfactory story to tell you than we have as the result of the working for 1935.

I now formally move:

> "That the Report and Accounts be received, adopted, and entered on the Minutes."

The DEPUTY-CHAIRMAN (Mr. A. M. Paddon, M.Inst.C.E.) formally seconded the motion, and, there being no questions or comments, the CHAIRMAN put it to the meeting, and it was carried unanimously.

The Dividend.

The CHAIRMAN then moved, the DEPUTY-CHAIRMAN seconded, and it was agreed:

> "That, pursuant to the recommendation of the Board of Directors, a final dividend be declared for the year ended Dec. 31, 1935, at the rate of 2½% on the ordinary stock of the Company, less income-tax, payable on Feb. 21, and that warrants for the same be forwarded by post to the Proprietors."

Re-Elections.

The DEPUTY-CHAIRMAN moved the re-election of the retiring Directors—Dr. Carpenter, Mr. Stanley H. Jones, M.Inst.C.E., and Mr. Harold G. Palmer. He said the difficulties to which the Chairman had so exhaustively referred were of degree, and their incidence in the Commercial Company's case was particularly heavy, by reason of special circumstances. The Chairman had drawn a pertinent analogy between a ship and their Company; well, no ship ever put to sea without expecting bad weather occasionally, but no crew expected to succumb. The one thing was to secure the best possible guidance and experience, and there could be no three gentlemen who, in their respective degrees, could contribute more effectively to the conduct of the Company's affairs in the difficult days that lay before it, than those whose re-election as Directors it was his pleasure to propose. Dr. Carpenter they all knew as perhaps the foremost exponent of gas technics to-day, while Mr. Jones and Mr. Palmer had been long associated with gas enter-

prises and were thoroughly competent to discharge their obligations to the shareholders and to the public.

Mr. FRANK H. JONES, M.Inst.C.E., seconded the resolution, which was carried unanimously.

The CHAIRMAN said that he and his colleagues were much indebted to the shareholders for having accepted with the unanimity they had done the story he had had to tell with regard to the last year's operations. It had not been pleasant, but he had been consoled by Mr. Paddon's remark that the difficulties were of degree. The Commercial Company were in the peculiar position of having nothing to help them over the difficulties. Whereas in other cases help might be afforded by extensions, the Commercial Company had for many years had no such possibility.

Mr. H. F. HILLS proposed, Mr. S. MADDOCKS seconded, and it was agreed, that the retiring auditor, Mr. B. W. Ellis, be re-appointed.

Mr. ELLIS, returning thanks, mentioned that he had been an Auditor of the Company for 25 years, and he had been a shareholder for half-a-century. This established his affection for the Company and his interest in its welfare.

The Employee-Director Scheme.

The CHAIRMAN: We now have to consider a proposal to vary the details of the scheme for the election of Employees' Directors. This scheme was approved in 1931 and slightly varied at the annual meeting of February, 1932. You will not be surprised to hear that it proved to be a distinct success. Messrs. Eady and Wickens were elected when the scheme started, and at subsequent elections they have continued to receive the support of their fellow employees. On behalf of my colleagues and myself I should like to say that we have found both gentlemen to be extremely useful members of the Board and to congratulate the co-partners on the wisdom of their choice. The scheme can only be varied with the consent of the proprietors in General Meeting, and the alterations which we are asking you to approve are due to (*a*) the reduction in the amount of the ordinary stock consequent on the exchange for debenture stock, and (*b*) to the effect of the reduced bonus now being earned on the aggregate stockholding of the co-partners. The opportunity is also taken to simplify several other clauses. The amount of the employees' holding is reduced from £140,000 to £123,000.

Clause 4 has been redrafted to read: "Following the rule of Joint Stock Companies that owners of stock shall elect the Directors, the object of this scheme is to confer similar power on the employee shareholders. The nominal value of the ordinary paid-up stock of the Company is, at Jan. 1, 1936, £1,775,005, of which the employees own £123,000 or thereabouts. If the nominal value of the aggregate stockholding of the employees after the annual allotment of stock (if any) in March of each year, *plus* the stock equivalent to the balance on the bonus account, shall fall back below £90,000, the number of Employees' Directors shall be reduced by lot to one, and if the value of such stock and bonus as aforesaid falls back below £50,000, the remaining Director shall be disqualified, and then only as provided in Section 12 can the Employees' Director be restored."

In Clause 6 the amount of the Employees' Director's qualification has been reduced from £140 to £90, and the clause simplified by eliminating words regarding the acquisition of the holding and cancelling the scale of fees which are fixed by a later clause. Originally the holding was hedged round with restrictions which we think out of date to-day. They were inserted with a definite object and in order to defeat certain happenings in the early days, but now we think it does not matter how a man has come by his holding so long as it is in his full and undivided possession.

Clause 9 is amended by striking out a reference to the retirement in the year 1933, now obsolete. Clause 11 is amended by stating the fee to be paid, and by eliminating unnecessary words which were difficult of interpretation; and in Clause 12 there is an alteration consequent on the re-drafted Clause 4. As re-drafted, two Directors can be elected, but if the aggregate stockholding falls below £90,000, the number is reduced to one, and if it falls below £50,000, the remaining Director is disqualified.

I beg to move:

> "That the variation in the Rules of the scheme for the election of Employees' Directors now submitted be, and the same are hereby, approved."

The DEPUTY-CHAIRMAN seconded the resolution, which was unanimously agreed to.

Votes of Thanks.

Mr. G. W. ILSLEY said he had a pleasing duty to perform—namely, to propose a very hearty vote of thanks to the Chairman and the other members of the Board for the extremely able manner in which they had conducted the affairs of the Company during 1935 and for many years before that.

Mr. B. W. ELLIS seconded this, and said the proprietors sympathized with the Directors and staff in their uphill fight. They thanked them for looking so keenly after their interests.

The vote was cordially carried.

The CHAIRMAN, after returning thanks on behalf of his colleagues and himself, said that in the exceptional circumstances he would ask the proprietors to express their appreciation of the efforts of the staff in the somewhat disheartening circumstances. They had worked exceedingly hard. Most of them had been brought up in a gas undertaking having very different prospects from what they were facing now. The reason he asked for this vote was because they had shown themselves in so many ways adaptable to the new conditions. They had fitted themselves into these new conditions, and it was with this knowledge that he felt every hope—though he was not going to make any promise—that at the end of this year there would be a better story to tell than there had been at the beginning.

The vote of thanks to the staff having been unanimously carried,

Mr. BRADFIELD, on their behalf, acknowledged the vote, which he said he knew was well deserved. He mentioned that it was just 25 years since he first had the honour of responding to this vote, and as he had reached retiring age it was unlikely that he would have the opportunity of doing so again. He wished to thank all who had helped him so loyally during the 35 years he had been with the Company. Nowhere could there be found better co-operation between all ranks of employees than existed in the Commercial Gas Company.

The South Suburban Gas Company

The Annual Ordinary Meeting of the Proprietors of the South Suburban Gas Company was held at the Abercorn Rooms, Bishopsgate, London, E.C. 2, on Friday, Feb. 21, 1936.

Dr. CHARLES CARPENTER, C.B.E., M.Inst.C.E. (the Chairman of the Company), presided.

The SECRETARY (Mr. Tom Brown, B.Com.) read the notice convening the meeting.

The minutes of the previous Annual Ordinary Meeting were taken as read.

The Register of Proprietors was sealed, and the Secretary read the Certificate to that effect.

The CHAIRMAN: Ladies and Gentlemen, I am told that this room is rather difficult to hear in. I hope it will not be this morning. I am not sure whether it is the acoustic properties of this room or the weakness of my voice or the noise through the windows, but I will do my best.

Ladies and Gentlemen,—You will remember that in 1927 you gave your consent to a scheme approved by your Board whereby the future capital requirements of the Company for gas distribution and sale should be provided by issues made directly on its behalf, while any increase in capital needs for gas production would be met entirely by taking such supplies from the South Metropolitan Gas Company, whose interests in our progress would be assured by its becoming our largest ordinary shareholder. I am pleased to be able to report that the arrangement has during the past year worked exceedingly well. Not only has the larger undertaking supplied all the extra gas we required, but, not less important, regular discussions have taken place between their and our officials which have placed at our service knowledge of a kind only to be provided by a body large enough to afford its own research organization.

Works and Stations Well Maintained.

Our various Works and Stations have all been well maintained. A booster capable of handling 8,400 therms per hour has been laid down at Sydenham, where we have also erected a coke handling conveyor in replacement of using trucks on our rail system. We have also largely extended existing coke storage hoppers by connecting them to a breaking and grading plant. In addition, our railway wagons have been renewed or replaced where necessary, and where possible bottom-discharge doors have been fitted. All our solid-tyred lorries used in the district have now been displaced by modern vehicles having air-cushioned wheels. Fuller use is now being made of our Belvedere storage station, which can be supplied directly from the large works of our neighbouring and associated Company. So that, instead of the gas being taken at Sydenham and pumped on from there to Belvedere, it is supplied now direct thereto.

Past Year's Activities.

The importance of restricting capital expenditure only to gas distribution and sale cannot be over-estimated when the large area of supply covered by us is considered, and the year's capital appropriation borne in mind: a few figures of our district activities will interest you. We have laid sixty-six miles of mains, two and a-half miles of which being for replacement. We have laid 10,300 new services, of which 1,300 were double ones. The combined length of these was 185,000 yds., replacement being excluded. There has been a net increase of 314 public lamps; the figure would have been higher by 232 but for disconnections in areas owning their electric generating

plant belonging to the local authorities. The gas consumption of these lamps has increased by 9½% and their illuminating power by reason of a better design of lamp by over 20%, and as the Report informs you new consumers have been added to the number of 9,284.

Apparatus and Showrooms.

Cookers, fires, radiators, water heaters, and various miscellaneous apparatus have also been freely sold or hired. We have added one showroom to the fifteen already in use, and are making good progress in the training of skilled attendants. The present methods of selling gas are very modern and novel, and there is no body of young people upon whom we can draw having the necessary knowledge, so that you can imagine we have to train them. I do not think there is any particular novelty about training them except that we have had to fall in with what is more or less in commerce and industry a normal obligation. A travelling exhibition is also being built for use in remote districts. We are shortly trying the experimental distribution of Calor gas in similarly placed districts not served by our mains.

The Calor organization requires agents, and we thought they might just as well have our organization instead of coming to fresh arrangements with various local people.

Industrial Gas.

The new gasholder at St. Mary Cray was put into service some weeks before Christmas, and has proved a very welcome addition to our storage system. Whatever we may do without to-day, we cannot do without gasholders, and you can imagine that in an area like the South Suburban we require them at various places all over the district. In spite of increasing competition we have added some noteworthy examples to our installations of industrial gas. The blot upon our distributing system is still, however, the high percentage of unaccounted-for gas which up to the present has resisted all our remedial efforts and continues to remain unaccountably unaccounted for at the too high figure of 6½%. In our 250 square miles of supply area, the mode of life by countryside seems on the move—changes inspired by road-making and estate building. Extensions thereto of gas for all purposes will help to preserve the amenities, clear air and smoke freedom, though we must regret the passing of so much of old historic Kent.

We have also with this in mind decided to keep gasholder construction, whenever possible, within the most restrained limits of height to the complete exclusion of a certain design which has certainly not won approval from the general public, and which runs the electric pylon, in my opinion, very close in its disfigurements of the landscape. Increases of gas at Sevenoaks and Tonbridge are better than with the undertaking as a whole being for Sevenoaks 5% and for Tonbridge 2·8%. Both these undertakings are, as you are probably aware, working independently of the main one—independently, I mean, as regards production and distribution—of which Sydenham is the centre, as regards gas manufacture and distribution.

We have now resold our river site purchased when the disadvantages of the scheme for erecting a new gas-works thereon were not fully appreciated by your Board.

Voluntary Addition to Price of Coal.

In common with all other similar undertakings, the Company has consented to a voluntary addition of 1s. per ton being made to all contracts for coal received between Jan. 1 and Dec. 31 of this year. What will happen at the end of December we cannot say. The purchase of coal through the agency run by the South Metropolitan Company at Newcastle-upon-Tyne continues its beneficial service to the Company.

The Superannuation Fund.

I must now refer to the Superannuation Fund initiated in the post-war flush of 1920, and to which I referred in moving the adoption of the Board's Annual Report two years ago. The Consulting Actuary had already pointed out that by the end of 1934 only one-half of the Fund's liabilities had been provided for, and further that the situation arising from the deficiency was more serious than anything which had come to his notice. And we had a similarly grave report from our Consulting Accountants, Messrs. Deloitte, Plender, Griffiths, & Co., in which they refer to the causes of the defects of the scheme as being (1) inadequate rates of contributions, (2) allowances of service without contributions, and (3) absence of elasticity in the provisions. After discussing the difficulties with one of the leading Life Insurance Offices, I came to the conclusion, and my colleagues accepted it, that the only thing to be done was to correct the old scheme by, with the help of the subscribers, formulating a new one. As the old Superannuation Fund had, as some partial justification for the large contributions made by the Company to its general assets, been charged with liabilities which more strictly pertained to amalgamations and staff transfers, it was decided to withdraw them and make a capital payment to the fund of the total—namely, £58,000, writing it off at the rate of £10,000 annually. The justification for the action of the Board is, I think, one which does not need much explanation. It had been providing year by year large sums to the fund, and when it took over additional liabilities as regards pensions both in respect of the later companies with which it amalgamated, and the increased staff necessary to carry on its duties with completeness and despatch, it was decided to place the obligation of those superannuation services on the fund that already existed. It was pointed out to us that that was not contemplated when, in 1920, the fund was started, and part of the trouble which we found the Company in arose from that. As a matter of fact, it was not serious, but it was at any rate decided that the proper thing was to take it out of the fund and deal with it by a capital payment. That is what we did.

Reconstruction of the Scheme.

There thus remained only the 1920 Fund and its accumulated deficit to be dealt with, and proposals were placed before the subscribers to share this shortage by (*a*) reducing their period of service and increasing their contributions, (*b*) being repaid their subscriptions with interest, or (*c*) continuing their then present conditions.

I am glad to say that a satisfactory result was, after very full discussions, arrived at. More than one-half of the subscribers accepted reconstitution, and more than one-third elected to retire and withdraw their contributions with interest. These last are entitled to join the new scheme as soon as it is launched. This will be completely detached as regards responsibility from the Company, except up to the agreed proportion of contribution of 50%. So that instead of giving an unknown and unmeasured guarantee, which was done in the past, the liability of the Company in respect of its fund will be a known and definite one. The still remaining present liabilities will be paid off by annual contributions by the Company extending over a period of 40 years from October, 1935. The position in which we find ourselves is not unlike the case of other undertakings and having the authority of our Consulting Accountants, one of the most reputable firms in the City of London, that a responsibility running over 40 years was a proper one to be undertaken, your Board had no hesitation in including that in the responsibilities they undertook on behalf of the Company. The Board desires to express its sincere gratitude to Messrs. Deloitte, Plender, Griffiths, & Co., Consulting Accountants, and to Mr. Duncan Fraser, Consulting Actuary, for the care and patience with which they applied themselves to the solution of a most difficult problem, one which has been engaging our attention for several years past and also to those officers and employees of the Company who, realizing the unfair advantage which had been taken of its generosity, accepted the Company's proposal—I only mean unfair in regard to the relationship between the Company and its consumers on the one hand and the shareholders on the other; I do not mean to say that the staff were not justified in taking advantage of the scheme as put before them, but which was bound in the long run to react upon the employees themselves.

The new scheme, moreover, will have no relation with the Co-partnership, inasmuch as whether the employees belong to it or not is immaterial from the point of view of the Superannuation Fund, while the Company's obligations will not extend further than the administration of the scheme, the collection of the contributions, and the handing over of them to the properly constituted authority.

Co-Partnership Bonus.

One word more in conclusion. I have had to deal with it very fully because the original story came before the shareholders, and it is only right I should make the story I have to tell now equally explicit. In the Company's Act of 1928 provision was made for a proportion of the Co-partnership Bonus to be transferred to the Superannuation Account. That is a policy which certain undertakings have followed, but it did not happen to be the policy which had been existing in this Company when 40 years ago we started Co-partnership. But when these difficulties arose and became, as they did, so very menacing, it was thought wise to make similar provisions with regard to the proportion of the Co-partnership Bonus as existed in other companies, so that in the appropriate Act provision was made by which up to one-half of the bonus could be applied to the Co-partnership Fund. The provision was made with the specire of an enormous Superannuation Fund deficit staring us in the face. With the newly constituted scheme this provision becomes unnecessary and, although I cannot bind the future management, we propose for the future, as we have, in fact, for the last three months, to credit the Co-partners with the full amount of the bonus.

That will mean restoring the conditions with regard to the bonus appropriation to what they were before the trouble to which I have referred arose.

Normal Progress.

I do not think I need make any further reference to the report. With regard to the working and all other matters, I think you may take it from me that the Company's progress is a fairly normal one, and that is true of the machinery at the various works, the method of working, and the maintenance of apparatus and so on.

I now formally move:

> "That the Report of the Directors and the Accounts examined and signed by the Auditors be received, adopted, and the Report entered on the Minutes."

Mr. HAROLD GUNDRY seconded the resolution.

There were no questions, and the resolution was then put to the meeting and carried unanimously.

Dividends.

The CHAIRMAN then proposed:

> "That dividends for the half-year ended Dec. 31 last be now declared on the Ordinary Stock at 3%, on the 5% Perpetual Preference Stock at 2½%, and on the 4% Perpetual Preference Stock at 2%, in each case less income-tax, making with the dividends paid on July 31, 1935, 6% for the year on the Ordinary Stock, 5% for the year on the 5% Perpetual Preference Stock, and 4% for the year on the 4% Perpetual Preference Stock, all less income-tax, and that warrants for the net amounts be forwarded on March 5 next to the registered addresses of the Proprietors."

Mr. HAROLD GUNDRY seconded the resolution, which was carried unanimously.

Additional Capital.

The CHAIRMAN proposed:

"That the Directors be authorized to raise by the creation and issue of Ordinary Stock or Preference Stock or partly by one or partly by the other of those modes the additional capital which the Company is by the South Suburban Gas Act, 1935, authorized to raise, and to attach to any such Preference Stock such preferences or privileges as to dividends or otherwise as the Directors may determine."

Mr. HAROLD GUNDRY also seconded this resolution, which was carried unanimously.

The CHAIRMAN: The next resolution I have to move is a similar one with regard to borrowing. We have just settled the point with regard to raising stock, and I now have a more or less identical motion to propose with regard to borrowing.

The CHAIRMAN proposed:

"That the Directors be authorized to borrow on mortgage of the undertaking or by the creation and issue of Debenture Stock any moneys which the Company may under the said Act from time to time be authorized to borrow, on such terms, subject to such conditions, and with such rights and privileges, as the Directors may determine."

Mr. HAROLD GUNDRY seconded the resolution, which was carried unanimously.

Re-Election of Directors and Auditor.

The CHAIRMAN then moved the re-election of the retiring Directors, Mr. Benjamin R. Green and Mr. Harold Gundry.

Mr. ARTHUR M. PADDON seconded the resolution, which was carried unanimously.

Mr. HAROLD GUNDRY: Ladies and Gentlemen, I wish to thank you very much for kindly reposing your confidence in me again. I can assure you I will do my best in the position in which you have put me.

On the motion of Mr. PIERCE, seconded by Mr. E. C. CONEY, the meeting re-elected Mr. Alfred Morland, F.C.A., an Auditor of the Company.

Vote of Thanks.

Mr. PIERCE: Mr. Chairman, I should like to propose a very hearty vote of thanks to you for presiding at this meeting and also to thank you and your co-Directors for all you have done for us during the past year. Might I also include all the members of the Staff, and particularly the Secretary, Management, and employees.

A SHAREHOLDER seconded the resolution, which was carried unanimously.

The CHAIRMAN: Ladies and Gentlemen, for myself and my colleagues I thank you very heartily for passing this vote of thanks. I would particularly thank you for the reference to the work done by the Staff. It is difficult to explain to anyone outside the Management how largely—I might almost say wholly—the progress of an undertaking of this kind to-day, whatever may have been the case in the past, depends upon the efficiency of the Staff and, above all, upon their working together to carry out the policy of the Board. The Board are quite competent to lay down a policy, but what is the good of that unless you have a wholehearted endeavour to carry out that policy in the spirit as well as in the letter. That is what I am pleased to say is done by our Staff. As in all probability our present General Manager will not be occupying that position at our meeting a year hence, as a result of his having reached the retiring age, perhaps Mr. Wastell will say a word or two with regard to his long service and return thanks to our friends here.

Mr. WILFRID WASTELL, F.C.I.S. (General Manager), who was received with applause, said: Mr. Chairman, you have rather taken me unawares. Although I have been in the service of the Company now for nearly a quarter of a century and my connection with the Gas Industry goes back for nearly 48 years, and it comes to an end in the early autumn of this year, I did not realize when I came here to-day that this would be the last opportunity I should have of expressing my personal thanks to you, Sir, and the Directors, the Staff and employees generally, for what has really been the great factor in the success of whatever work I may have done for the Company since I came into it in 1912. I am old enough now to realize, and the older I get the more I do realize it, that no one man by himself can hold and develop the position he is occupying without encouragement, first from the Chairman of the Company—and it has been my privilege to serve under three Chairmen, the last, but not least, being our present Chairman. My work has been increasingly difficult, but I felt I had the support and encouragement—and I emphasize that word "encouragement"—particularly in my association with Dr. Carpenter and the encouragement and help of the whole of the employees of the Company, from the chief Officers down to the youngest boy in the service. As I say, I did not think for one moment that I should have the opportunity of speaking to you, but I am looking forward now to a period of retirement long or short, as the case may be, when I shall be more or less my own master. I expect there is not much satisfaction to be found in that, because when one is one's own master one feels he has to depend entirely on himself. It has been rather nice to feel that my word has not been the last word, and that I have always had ready access to you, Sir. Therefore, when I lay down the work and develop some of my hobbies, I am not sure that I shall get on as well when I myself have the last word in anything I have to do. I have always felt that I had at the back of me somebody better qualified to decide important matters than myself. I want now, although it seems rather early, to take this opportunity of thanking, from the bottom of my heart, you, Sir, and the Directors and every one of the employees who have made my work comparatively easy. [Applause.]

Extraordinary Meeting.

An Extraordinary Meeting of the Company was then held. The Secretary having read the notice convening the meeting,

The CHAIRMAN said: Ladies and Gentlemen, the object of the Bill is, as described in the notice calling the meeting, "to confer further powers upon the South Suburban Gas Company; and for other purposes," and the most important item in the Bill is that covered by the statement in the preamble that "it is expedient to authorize the Company to use additional lands for the storage of gas."

Dealing *seriatim* with the clauses of the Bill, the *first clause* gives the short and collective titles, the *second* provides for the incorporation of General Acts, and the *third* is the interpretation clause.

Clause 4 authorizes the lands described in the Schedule to the Bill to be used for the storage of gas.

You know we have an authorization to acquire land, and the next authorization we want is to use it for certain purposes—in this case for the storage of gas.

The lands in question comprise seven sites and are shown on the cartoon exhibited, as follows:

(1) At Darenth	Comprising about	$2\frac{1}{8}$	acres.
(2) At Eynsford	,, ,,	$1\frac{1}{2}$	,,
(3) At Sutton-at-Hone ...	,, ,,	$5\frac{1}{2}$	,,
(4) At Kemsing	,, ,,	1	acre.
(5) At Shoreham	,, ,,	$1\frac{1}{2}$	acres.
(6) At Crayford	,, ,,	$4\frac{1}{4}$	,,
(7) At Cudham	,, ,,	3	,,

The improvement in transport facilities in the outer parts of the Company's area of supply has stimulated for some years past the rapid development of large tracts of land for residential purposes and the laying out of new town-planned roads has thrown open for development purposes large areas which normally would not be utilized owing to their remoteness. Large building estates have been laid out and building development is continuing in various parts of the area of supply, particularly in such places as Sidcup, Orpington, Welling, Erith, Crayford, West Wickham, and Hayes. Practically all the development is of a residential character, consisting of the smaller type of houses in the main, bringing in its train problems of supply to meet greatly increased demands for gas and large peak loads. That is, peak loads arising mainly on Sundays for cooking and for those times of frost which have been so noticeable this year. An additional gasholder was erected and put to work last year at St. Mary Cray to supplement the storage capacity necessary, and additional trunk mains have also been laid. The question of additional gasholder sites necessary to enable an adequate supply of gas to be given over the greater part of the Company's area of supply has been under review for some time past, and in some cases negotiations have been taking place during the whole of last year to arrive at the most suitable sites for this purpose from the point of view of meeting the requirements of the public for the supply of gas consistently with the preservation of local amenities.

As an illustration, the case of Eynsford, Item No. 2, may be taken.

Very extensive development is likely to take place in the vicinity of Eynsford and in connection with the Lullingstone Park Estate. Over 5,000 acres of land have been sold, the development of which may proceed steadily having regard to the improved transport facilities which have been made available. I think I am right in saying that whereas the old method of opening up an estate was first of all to build houses and then make provision for transport, with modern large estates the builders' plan of campaign is to put down a road first and use that road for bringing the necessary building material to the site, instead of building the houses first and transporting materials over something like a ploughed field. The stations at Swanley Junction and at Eynsford have been improved, and a new station is proposed in the near future near the centre of the estate. The total development contemplated for this area is very extensive.

At the beginning of last year about 77 acres of the land just east of Eynsford Station were sold for estate development, and a supply of gas was asked for the houses to be erected. Negotiations took place to secure a site for gas storage purposes, and eventually, after a number of sites had been considered, we were offered a site in the village of Eynsford at the rear of the fire station.

This site lies at the rear of the properties fronting on the east side of the main road passing through Eynsford, and there are farm land and allotment gardens in the immediate vicinity; in addition, the local Fire Brigade Station and a garage are close to the site. At a distance of about 300 yds. are located the paper mills of Messrs. Arnold & Foster, Ltd.

As the Eynsford Parish Council, the Dartford Rural District Council, and the Kent County Council all intimated that they did not desire to raise any objection to the erection of the proposed gasholder, the Company proceeded to acquire the site and to secure it for the storage of gas by proceeding under Section 5 of the Gas-Works Clauses Act, 1871, which requires "the previous consent in writing of the owner, lessee, and occupier of every dwelling-house situate within 300 yds. of the limits of the site where such gas is intended to be stored." As is perhaps to be expected, it did not prove possible to obtain the written consent of every such occupier, and as the estate developers were pressing for a supply of gas to be available to the houses now in course of erection, it became apparent that it would be necessary to promote a Bill to seek statutory powers to schedule the site, which would enable Parliament to adjudicate between the various interests concerned, in case of opposition.

Dealing with the *remaining six sites*, that at *Darenth* is situated on the west side of the road leading from Dartford to

Meopham via Longfield and adjoins a gipsy encampment. The site is required in view of future development in this district and would enable the supply to be extended in due course. In the last five years the sales of gas have increased very substantially in this area.

In the case of the site at *Swanley* (*Sutton-at-Hone*), the investigations into the question of acquiring a suitable site have extended over the last sixteen months, and the site acquired is to the north of the grounds of the White Oak Hospital and the Alexandra Hospital, and is used at the present time for allotments. It lies well back from any public highway and is approached along a footpath—it is required in view of the building development taking place in the neighbourhood and the steadily increasing demand for gas.

The site at *Kemsing* is situated on the west side of Seal Road and about 500 yds. from the centre of the village of Kemsing; it lies back from the roadway for a distance of between 300 and 400 ft. A holder would be required to enable a supply of gas to be given to the village of Kemsing and the surrounding neighbourhood, where no gas is at present available.

The site of *Shoreham* is located in Jenkin's Neck Wood. The surrounding land is very wooded and very little obstruction to the view would be offered by the proposed holder. The site is being acquired so that we may be in a position to supply gas in the neighbourhood when occasion arises. In a rapidly developing area like this it is no good making provision after the houses are built. Provision ought to be made as regards the sites for gasholders before the builder comes along and makes the roads and builds the houses that are to be supplied with gas.

With regard to the site at *Bourne Road, Crayford*, this is in substitution for the site adjoining the existing works of the Company at Crayford, which was included in the schedule to last year's Bill, but which was afterwards withdrawn by arrangement with the local authority. The site at Bourne Road, Crayford, is now substituted for it, the local authority having decided to support the Company's application for it to be scheduled. The site abuts upon the south side of Bourne Road, near the factory of Messrs. D. H. Wood & Co., and is on land scheduled for industrial purposes. It is, in effect, an extension of the existing holder site to meet the increased demand for gas consequent upon recent building development in that area.

The site at *Cudham* is located in the village of Single Street on the west side of the road passing through the village and approximately 2 miles south-west from the village of Downe. There is no supply of gas there at the moment, but it has been realized for some time that the Company should obtain a holder site in the parish of Downe or in the immediate neighbourhood—the supply is at present being extended to Downe.

The *remaining clauses* of the Bill are common clauses. Clause 5 would empower the Company to lay pipes for ancillary purposes subject to similar conditions as apply to pipes for the transmission of gas. The ancillary purposes referred to are such purposes as the handling or disposing of oil or materials used by or resulting from the manufacture of gas or its residual products.

Clause 6 is one for which there are a number of precedents. It is described in the marginal note as being a "special provision for benefit of small investors" and would enable, subject to certain safeguards, a proportion not exceeding one-fourth of any future issue of Ordinary or Preference Stock to be reserved for exclusive offer to gas consumers and employees of the Company.

The next clause, No. 7, is a common feature of modern Acts and Orders and permits the Company to purchase Debenture Stock of the Company at the market value and to apply capital moneys for this purpose; securities so purchased must be cancelled.

Clause 8 of the Bill is designed to remedy an omission in the Company's 1928 Act. Where, as in the case of a basic price Company, Section 31, &c., of the Gas-Works Clauses Act, 1847, are not incorporated, special provision is usually made for the formation of three funds—a reserve fund, a special purposes fund, and a renewal fund. The first two are provided for in Sections 44 and 45 of the Company's 1928 Act, but a renewal fund is not provided for. The object of such a fund is to enable reserves to be built up out of revenue for equalizing repair and maintenance charges—the contributions to the fund are limited to an amount not exceeding 1% of the paid-up capital of the Company in any one year, with a maximum total for the fund of 5% of the paid-up capital.

Clause 9 refers to joint holdings of stock of all classes—*i.e.*, Ordinary, Preference, or Debenture, and repeals Section 26 of the Company's 1928 Act, which refers to Debenture Stock only.

Clause 10 refers to the closing of Transfer Books. Clause 11 provides for the substitution of a card index for the shareholders' address book, required to be kept by the Companies Clauses Consolidation Act, 1845; Clause 12 expedites process in cases where it may unfortunately be necessary, by allowing all the sums payable by a person to be included in one summons; Clause 13 provides in sub-clause (1) for the extension of Section 46 of the Company's 1928 Act to cover, in respect of nominations by employees for transfer of stock held by them, *all* stock of the Company instead of Ordinary Stock only, and in sub-clause (2) extends somewhat the powers granted in Section 22 of last year's Act with regard to streets forming the boundary of the limits of supply.

The last clause, No. 14, is the usual clause enabling the costs of promoting this Bill to be charged wholly or partly to revenue.

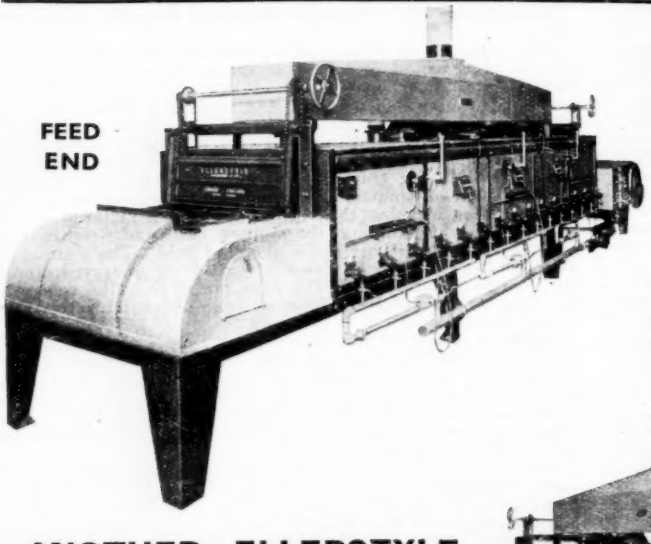
The *resolution* to be moved is as follows:

"That the Bill now submitted entitled:

'A Bill to confer further powers upon the South Suburban Gas Company; and for other purposes'

be and the same is hereby approved subject to such additions, alterations, and variations as Parliament may make therein, and the Directors may approve."

Mr. HAROLD GUNDRY seconded the resolution, which was carried unanimously, and the proceedings then terminated.



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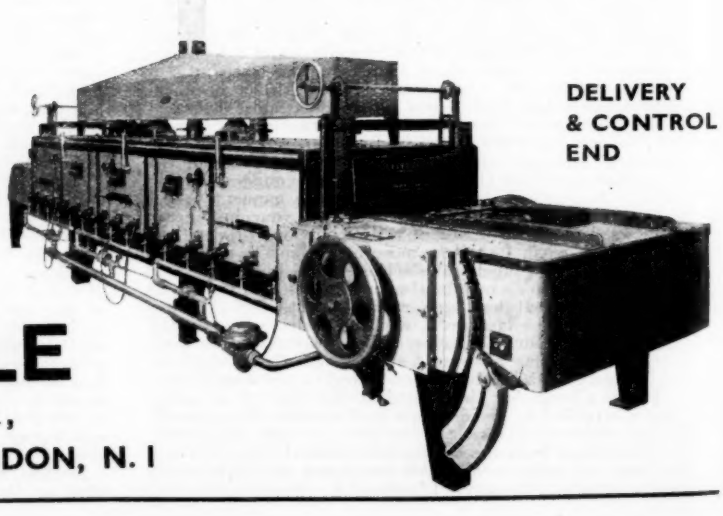

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68, COLEBROOKE ROW, LONDON, N. 1

The Tottenham and District Gas Company

The Annual General Meeting of the Tottenham and District Gas Company was held on Tuesday, Feb. 18, 1936, at the Chief Office of the Company, Woodall House, 658, Lordship Lane, Wood Green, N. 22—Mr. HENRY WOODALL, M.Inst.C.E. (Chairman and Managing Director), presiding.

The SECRETARY (Mr. Edward J. K. Fussell) read the notice convening the meeting, after which the common seal was affixed to the register of proprietors.

THE CHAIRMAN'S ADDRESS.

The CHAIRMAN said: In reviewing the year 1935 there is one outstanding event—namely, the King's Jubilee, and we then had the opportunity of showing our admiration and affection for King George V. The opportunity was enthusiastically taken advantage of by all His Majesty's subjects, and our devotion will be continued to King Edward VIII.

I am sure you will wish me to express our deep sympathy with the King, Queen Mary, and the rest of the Royal Family in the great loss they and we have sustained in the death of King George V.

You will, I presume, take the Report and Accounts as read. [Agreed.]

In the Report you will have seen recorded the death of two of our Directors, Mr. William A. Surridge and Mr. Thomas Goulden. Both these gentlemen had delightful personalities besides having large experience, and we shall greatly miss them and their sound advice. To fill the vacancies created we have appointed Mr. Harold Godfrey Palmer and Mr. Charles Selwyn Pryor.

Turning to the accounts you will see that we have raised £135,610 4% debenture stock, on which we obtained £6,102 premiums. We expended during the year £38,822, and the depreciation of meters, stoves, and plant, plus a profit on sale of land of £7,086, amounted to £40,325; so there is a credit on capital of £1,503. The total capital expenditure is £1,816,619. This represents an expenditure per million cubic feet of gas sold of £456, as against the figure of £461 at the end of 1934. Your Directors very carefully watch the capital expenditure in relation to business, and it is satisfactory to see a reduction.

Revenue Account.

Turning to the revenue account, it will be seen that the total expenditure during the year has been £925,765, while the total receipts amount to £1,061,025, leaving a balance of profit of £135,260—an increase of £1,369.

Coal has cost a little more, but we have made more gas. The outstanding increases are on repairs and maintenance of works, mains, and fittings—over £27,000. The very big increase in these items—an ever growing one—is due largely to the rapid development of our district and the increasing service we have to give to often widely scattered consumers.

There are small increases in the cost of Co-Partnership and Pension Funds, which we do not grudge, as these funds are highly appreciated and help to foster the good relations which exist between employers and employed.

There is one very satisfactory figure—namely, the cost of manufacture, which is considerably down and is equivalent to a reduction of £32,373. In 1934 the reduction was £16,438—a total saving in the two years of £48,811. This reflects great credit on our Chief Engineer, Mr. H. C. Smith, and his Staff.

Good Return from Residuals.

On the receipts side of the account I would draw your attention to the excellent returns from residual products. The increase in this item alone is over £30,000. You will note with pleasure that, as I forecast when I addressed you a year ago, there is a credit on sulphate of ammonia as against a debit last year, due to the erection of a sulphuric acid plant and the utilization of our own spent oxide.

Our increase in sale of gas is smaller than we hoped, being just over 39 million cu.ft., but last year was unsatisfactory from a gas-making point of view, as we had little cold weather.

We have started this year well, and our increase in sales up to date is over 44 million cu.ft.—or more in the first seven weeks of this year than in the whole of 1935. The gas fire is becoming more and more popular and temperature consequently plays a larger part than ever in our sale of gas.

There is a slight decrease in receipts from public lighting owing to reductions in price, but I am glad to be able to tell you that in spite of very severe electrical competition we have increased—though only by a small number—our public lamps, and we are proud of the fact that we are to-day lighting by gas more than 80% of the public lamps in our area.

The result of the year's working is that, after transferring to the suspense accounts the sum of £10,000, we are able to pay our maximum dividends, add to our reserve fund and special purposes fund in all £4,314, and increase our carry-forward, now standing at £54,178, by £1,329.

The Coal Industry.

You will expect me to refer to the voluntary payment of 1s. a ton which the Gas Industry, among other public utilities, has agreed to pay towards a fund to increase the coal miners' wages. This was only agreed to after long discussion and very careful consideration. The Government urged it upon us. We remembered the 1926 Strike which did such incalculable and permanent injury to our great coal industry and to the country as a whole, and we knew that public opinion was in favour of help being given to the miners.

At the same time we are strongly of opinion that much can, and I trust will, be done to improve the conditions in the coal industry. Many of us feel that if the coal industry were properly re-organized coal should be obtainable at a lower rather than an increased cost. The main trouble at the moment is that under the Coal Mines Act of 1930 collieries, whether efficient or inefficient, are allotted quotas.

Cheap fuel is an essential to prosperity in this country, and to endanger that would cause infinitely more unemployment than closing inefficient pits. Inevitably, if pits are closed, some unemployment would ensue, but it is only general and increased prosperity throughout the country which will enable us to reinstate the unemployed, not necessarily in their own particular trade. It seems to me that something on the lines of the compensation levy, such as exists for compensation of licensed houses which are regarded as redundant, might well be considered by the coal industry, and thereby enable them to deal with redundant collieries.

Your Directors have decided that at the moment they will not make any increase in price of gas to meet the enhanced cost of coal to which we have voluntarily agreed. It is hoped that the necessity to call for outside assistance will not be long continued and that the coal industry will by the end of the year be in a position to meet its own liabilities without increasing the cost of coal.

If you have not read it, I would refer you to the Address of Sir David Milne-Watson, Governor of the Gas Light and Coke Company, in which he deals very ably with the coal situation. His Address was reported in full in *The Times* and other newspapers on Feb. 8, and will, I am sure, act as a tonic to gas shareholders.

Absorptions by the Company.

In the early part of last year application was made to the Board of Trade for an Order to authorize the absorption of the Hitchin and District Gas Company, the Stevenage Gas and Coke Company, Ltd., the Biggleswade and District Gas Company, Ltd., and the Shefford Gas and Coke Company, Ltd. An Enquiry was held on July 19, 1935, and an adjourned Enquiry on Nov. 15, 1935, and eventually the Tottenham and District Gas Order, 1935, was granted. Under the provisions of this Order the Undertakings mentioned have been transferred to this Company as from Jan. 1, 1936. As a consequence the Company are freeholders of the Undertakings instead of shareholders. There will be added to the Company very nearly 10,000 extra consumers and in total sales approximately 200 million cu.ft.

The Company in March last took over the business of the Dunstable Gas and Water Company, a large majority of the gas shares being purchased by this Company and of the water shares by the Trustees of the Company's Pension Fund. It is, as you know, very difficult at the present time to find sound and remunerative investments, and the Trustees of the Pension Fund welcomed this opportunity.

We have every reason to expect the Dunstable Undertaking will be a thoroughly sound investment. The town and district are growing rapidly. The increase in output in 1935 was over 12%, and the increase in 1936 to date has been over 20%, which is most satisfactory and encouraging.

I have gone rather fully into the question of recent purchases and amalgamations, and the story which began with the compulsory acquisition of our Wood Green Electricity Undertaking for £230,000 is now completed. We had this large sum of money and the difficulties of investment were considerable. Your Directors were fortunate, perhaps I might say enterprising, and we are all—not forgetting the Chief Officials—to be congratulated on having obtained some very sound properties.

Sound Position of Pension Fund.

You have had the accounts of our Co-Partners' Pension Fund before you and will have seen that we have now invested out-

side the Company £274,000. The to-day's value of these investments is £316,000. Every five years we have an actuarial valuation of the fund, and are satisfied that it is quite sound. At the present time the interest and dividends on our investments considerably more than cover the pensions paid, and the fund is consequently steadily increasing.

As I mentioned before, the increase in our business has not been large, but we have sold more apparatus than ever before and have added in our old area 4,725 new consumers. The use of gas for industrial purposes is growing rapidly; in 1932 it was 337 million cu.ft., and it is now 538 million cu.ft. We have a special department to deal with this important side of our business.

It is now 25 years since you did me the honour to elect me a Director of this Company, and I will conclude my remarks by giving a few figures showing the growth of the Undertaking during that period.

—	1911.	1935.
Sale of gas (million cu ft.)	2,100	4 000
Consumers	76,300	138,400
Employees	800	2,146
Area of supply (square miles) . . .	16	403

These figures speak for themselves. I would specially call your attention to the enormous increase in our statutory area of supply. It does mean a considerable addition to the demands on the time of your Directors and greatly adds to the interest of their work.

Results such as we are able to put before you can only be obtained by combined, or shall I say collective, action, and I can assure you that your Directors greatly value the services which are so loyally given them.

I now have much pleasure in moving:

> That the Report of the Directors and Statement of Accounts for the Year to Dec. 31, 1935, be received and adopted and that the Report be entered on the Minutes of the Proceedings of this day.

The DEPUTY-CHAIRMAN (Mr. Henry Bailey) seconded the resolution, and there being no response to the Chairman's invitation to shareholders to ask any questions in regard to the Report, it was put to the meeting and carried unanimously.

Dividends.

The CHAIRMAN thereafter proposed:

> That a Dividend at the rate of 5½% and 5% per annum respectively on the preference stocks, and £6 15s.% per annum on the ordinary stock, all less income-tax, be declared for the half-year ended Dec. 31, 1935, payable on Feb. 27 next, and that the Dividend Warrants be sent to the proprietors by post.

The DEPUTY-CHAIRMAN seconded this proposition, which was unanimously agreed to.

Re-Election of Directors and Auditor.

The CHAIRMAN then proposed the re-election of Mr. Henry Bailey, being one of the Directors retiring by rotation. Mr. Bailey, he said, had been a Director of this Company for forty years; he was now the senior Director and knew the business of the Undertaking inside and out and was most interested in all the details of its working. He was a very valuable Director both to the Company and to the proprietors, and he was sure they would be most happy to re-elect him.

Mr. A. E. BROADBERRY, M.Inst.C.E., in seconding the resolution, remarked that he had known Mr. Bailey during the whole of the forty years he had been on the Board of Directors, having himself been in the service of the Company for fifty-seven years. He could testify to the value of Mr. Bailey's services to the Board and to the Company. He therefore had very much pleasure and every confidence in seconding that resolution.

The proposition was carried unanimously, and in acknowledgment, Mr. BAILEY thanked the proprietors very much for his re-election to the Board. He had a very great interest in the Company, and he felt that it was one of the chief things in his life—at any rate, during the past thirty years. So long as he could be of use to them he would be very pleased to remain on the Board.

The CHAIRMAN then moved the re-election of Mr. Harold G. Palmer, the other Director retiring by rotation. Mr. Palmer much regretted that he was unable to be there that day, and the Chairman read a letter from him apologizing for the fact that he was on the Continent in connection with the business of the Imperial Continental Gas Association, from which he was unable to be excused. Many of the shareholders, continued the Chairman, might not know Mr. Palmer, who had only recently been elected to their Board. But he had been a Director with him on the Board of the British Gas Light Company for twenty-two years, while he had also been a Director of the Imperial Continental Gas Association for about the same period, as well as a Director of the Commercial Gas Company. He had considerable experience of gas undertakings, particularly in regard to the manufacture and distribution of gas abroad. They could learn a great deal to their advantage from France, Germany, and other countries; Mr. Palmer therefore had many qualifications for a good Director, and he had much pleasure in proposing his re-election.

This resolution was seconded by Mr. E. C. WOODALL and carried unanimously.

Mr. KENNETH R. MACKAY moved, and Mr. BALDRY seconded, that Mr. William Cash, Junr., F.C.A., the retiring Auditor, be re-appointed, and this was unanimously agreed to, Mr. CASH briefly acknowledging this renewal of their confidence, which he very much appreciated.

Increased Remunerations.

Mr. J. BEALE then proposed that the annual fees of the Directors of the Company be increased from £4,000 to £5,000, and that those of the Auditors be increased from £500 to £600. In doing so he remarked that all concerned were to be congratulated on the successful results of the past year. He would like to compare some of the figures which had been quoted with the corresponding ones of 1923. In the year 1923 sales of gas were 2,682 million cu.ft.; in 1935 they were 3,984 millions—an increase of 50%; and after Jan. 1 of the present year there would be an additional increase of 200 million cu.ft. as a result of amalgamations. The number of consumers in 1923 was 87,000; last year they numbered 138,000. On top of that, he believed he was right in saying that the stock of the Company now stood at 150, which was a very useful figure. Indeed, all these figures certainly expressed striking signs of consistent progress. How had this been brought about? He suggested that it was a result of the Directors keeping up-to-date by securing and utilizing the latest scientific and technical improvements, by a well-judged policy, and by meeting all competitive invasion. He would therefore like to refer to the remuneration of the Board in relation to the amount of work entailed. In the year 1923 their fees were £2,500, which had been increased to £4,000. Since then eight other Companies had been amalgamated, and as Directors of those undertakings they had automatically lost their fees as a result thereof. In view of the figures he had quoted, he considered that the time was ripe for a further adjustment, and he moved that the Directors' remuneration be raised from £4,000 to £5,000. By so doing the shareholders would be showing appreciation of their efforts and how well they considered that the Board had maintained the standard of the Company. Furthermore, the increased business involved additional work in connection with the accounts; the preparation of the accounts was carried out in accordance with the best traditions of accountancy, and he was confident that they would receive the best services from their Auditors as they had done in the past. He therefore recommended that the Auditors' fees be increased by £100. He would like to take these two resolutions in one.

Mr. J. TAYLOR seconded the proposition, which was put to the meeting and carried unanimously.

The CHAIRMAN thanked the proprietors for this resolution. The figures which had been quoted did indicate that the amount of time the Directors necessarily had to give to the Company had been considerably increased, and the results had been progressively good now for a good many years past. As Mr. Beale had pointed out, the Directors had lost fees in connection with those undertakings which had been absorbed, and it was therefore kind of the proprietors to vote them a little more than they had forfeited by the new order of things. The Board thanked them very much, and they would continue to do their best to deserve this additional remuneration.

Vote of Thanks.

Mr. S. L. SANDELL thereafter proposed that the best thanks of the proprietors be given to the Chairman, Directors, and Auditors, and also to the officers, staffs, and workmen for their services to the Company during the past year. It had never been denied, he observed, that deeds spoke louder than words, and the excellent results of the Company represented a deed which spoke louder than any words of his. Mr. Beale had already said a great deal of what he would have liked to have said in regard to the Chairman and Directors; but his feelings were tinged with a little sadness because they missed two familiar faces on the Board. They welcomed, however, their new Directors, whose services to the Company would, he felt sure, equal those which had been lost. So far as their Auditors were concerned, the statement of accounts could not be excelled for the clarity in which they indicated what had been achieved during the year. The Company's officers had an enormous task in directing the large staff now employed by the Undertaking. In regard to the staff and workmen they—like the soldiers during the war—had one or two "grouses," but, taken as a whole, they were a fine body, whose loyalty was unequalled.

Mr. W. PHILLIPS, in seconding the vote of thanks, said that he had known their Chairman and many of the officers of the Company and also their Auditor for many years, and he knew that what had been said of them was heartily deserved.

The CHAIRMAN, in acknowledging the vote of thanks, which was unanimously accorded, remarked that he was rather amused that Mr. Sandell had thanked the Auditors for the clear statement of their affairs. Actually, this statement was rather due to their Secretary and his staff; and all the officials and workmen, too, were as good a body of men as any undertaking could wish for. The Tottenham Company were one of the first concerns, after the South Metropolitan Gas Company, to adopt co-partnership, and it had now been in existence for a long period. Their pension fund had also been in existence for many

years, and in operation for the past ten years, so that their employees recognized clearly that the Company did not quite forget them when they had finished working for them.

Mr. H. C. SMITH, M.Inst.C.E. (Chief Engineer), acknowledged the vote of thanks on behalf of the technical staff, which, he said, would be received with gratitude by all of them. There was, however, one thing which would be received with even greater gratitude—and that was the abolition of coal quotas. They could imagine the works engineer and his staff doing their best to make gas at the lowest possible price, and then they would find, at the end of the month, that they had no more coal owing to the operation of the Coal Mines Act, as the colliery from which they obtained their supplies, and with whom they had their contract, was working on short time as a result of the quotas. This was most annoying, and was undoubtedly one of the "grouses" to which the proposer of the vote of thanks had referred.

Mr. FUSSELL also acknowledged the vote on behalf of himself and his staff. So much had been said about the Company that he could not say anything more except that he was proud to be an officer and prouder still of his staff.

The meeting then terminated.

The Croydon Gas Company

The Annual Ordinary General Meeting of the Croydon Gas Company was held at the Company's Chief Offices, Katharine Street, Croydon, on Friday, Feb. 21—Mr. WM. CASH, J.P., F.C.A. (Chairman of Directors), presiding.

The SECRETARY (Mr. Frank F. Wood, F.C.I.S.) read the notice convening the meeting; and the Minutes of the preceding Annual General Meeting were read, confirmed, and signed. The Register of Proprietors, to which the Seal had been affixed, was also duly signed.

THE CHAIRMAN'S ADDRESS.

The CHAIRMAN, before moving the resolution for the adoption of the Directors' Report and Statement of Accounts, recalled that he had been absent from their Annual Meeting last year, on which occasion they had been kind enough to express the hope that he might soon be restored to health. He was glad to say that he had been, and was very pleased to be with them again.

The first resolution he had to move was as follows:

> "That the Report of the Directors and the Statement of Accounts for the year ended Dec. 31, 1935 (a copy of which has been sent to each Proprietor), showing a balance of £98,373 11s. 2d. available for dividends, be, and the same are hereby, received and adopted, with the exception of the paragraphs relating to declaration of dividends and the election of Directors and an Auditor, which are to be considered separately."

In moving that resolution, said the Chairman, he would like to follow his usual practice of making a few observations upon the Report and Accounts. But before they dealt with the financial business, they would observe two or three domestic matters on the second page of the Report. The first was of an exceptional nature—namely, the resignation of Mr. Charles Hussey from the Board of Directors. He had been a Director of the Company for 45 years, for 31 of which he had been Chairman. The Directors had passed a resolution which they had set out in the Minutes as a permanent record of his services to the Company. He could not do better than read the words of that Minute, which endeavoured to express their appreciation of all he had done. It was as follows: "It is desired to place on record the deep regret at the resignation of Mr. Hussey, and to express appreciation of his valuable services rendered to the Company for 45 years. He held the position of Chairman for 31 years, until March 16, 1923, and during the whole time he was a Director he had devoted himself to the interests of the Company and the welfare of the employees; and the Directors wish to tender their best thanks to him for his work."

As proprietors of the Company they also desired to acknowledge all that Mr. Hussey had done for them. His was a wonderful record.

To fill the vacancy thus caused on the Board, the Directors congratulated themselves and the proprietors upon securing the services of Mr. Ernest E. Bird. Those who did not know him would be interested to know that his name was well-known in London; he was an eminent solicitor and a Member of the Council of the Law Society. He was a Director of several companies, including the Legal and General Assurance Society, of which he had just become Chairman. In having him on the Board of the Croydon Company they had a gentleman of wide business and legal experience, which would be of the greatest possible value.

There was one particular absentee from their Meeting that day—and that was Mr. Sandeman, their General Manager. He had been seriously ill since the beginning of the year, and, though the Chairman was glad to say he was now better, he had gone away for a little rest, and they thought it would be wiser for him not to be there on that occasion. He was sure they would all like to send Mr. Sandeman their best wishes for his speedy and complete recovery.

The Accounts.

Turning now to the Accounts, the Chairman pointed out that the receipts side of the Capital Account showed that an issue of stock had been made locally in May, 1935. This was £75,000 of Maximum Dividend stock which they offered at 114, and in two or three days they received application for half a million pounds of stock, which was a very gratifying testimony to the Company and to local residents' belief in it. They would notice that the following item referred to the 7½% Preference Stock (1936), and they would be interested to be reminded that this stock was issued in 1921, when money was very dear, at 96 under the Public Utility Companies (Capital Issues) Act, 1920. This issue was to be paid off in a few months' time, and he was confident that they would be able to replace it at a very different rate of interest, which would mean a substantial saving in the future.

On the expenditure side, they had bought another piece of land at West Wickham, together with premises for a small showroom at Carshalton, while at the gas-works they had replaced their old-fashioned electrical generator with a modern plant as a standby and safeguard in the event of a possible breakdown in the grid system from which they obtained their works power.

Over 16 miles of mains had been laid during the past year, while they had used on carcassing and services 130 miles of cast-iron and wrought-iron tubing throughout the district.

A year ago it was proposed that the proprietors should be given the opportunity of going round the works, and they made arrangements accordingly whereby last May 500 to 600 persons visited the works and expressed great pleasure and interest in all they saw and in the good state of efficiency they were in.

The Revenue Account.

Turning to the Revenue Account, the Chairman went on to say that they had had a very satisfactory increase of 2·59% in the sales of gas. Such percentage figures might seem relatively small because they were dealing with very large totals; but in terms of actual output it represented an increase of 71 million cu.ft., which was a large quantity. In their Oxted area, which they took over a few years ago, they had had an increase of 5·86%. The total increase to date this year was already 5½%. They were, of course, affected by the state of the weather. They had added 4,033 new consumers during the year, and they now had 48,885 ordinary and 49,563 prepayment consumers, making a total of 98,448, so that they had very nearly reached the hundred thousand mark.

They were at present engaged in bringing in stoves on hire and concentrating on selling on hire-purchase, and the number sold, including hire-purchase, was up by 12,774. A new line of business was in refrigerators, for which there had been a large market; a total of 250 had been sold, which, considering that it represented an expensive piece of apparatus, was very satisfactory. Moreover, a census taken last December revealed that practically all these refrigerators were in use—even in winter—which indicated that people were utilizing them not merely for the purpose of producing ice or iced dishes, but for purposes of preserving food. The sales of major appliances showed a net increase of 13,391, and they were continually developing this business—as, for instance, the use of gas for central heating as apart from coke. Such installations were not, of course, for the smaller type of house but rather large apparatus for extensive premises. An example of this was to be found in the new civic building of the Beddington and Wallington Urban District Council, where gas central heating plant had been installed, while most of the local proprietors would know of Marks and Spencers' premises in Croydon, which were heated in the same way.

Their showroom sales had increased by £38,403 to £128,326, which was a record they had never reached before, and it was wonderful how these sales continued and how well the showroom and district staff did in selling gas appliances. There was no doubt whatever that all their showrooms were paying propositions on a strictly commercial basis. Some 4,500 visits were paid to the homes of consumers, when housewives were given help and instruction in the best use of the gas appliances in their houses. The total attendances at their lectures throughout the district had been 12,439 during the year.

Residuals had also done well. Coal had cost more; but they

had sent out more gas. On the other hand, residuals had helped; coke prices had been better, and the total increase in residuals amounted to £8,133.

One matter which in modern gas-works practice was universal was the cost of distribution, and in their own case this was substantially up, particularly in respect of mains, services, and fittings, while they had also spent more on advertising than they used to. That, at the present time when they had to provide good service, was money well spent. Their works results, as a result of the excellent work of the staff at Waddon, were excellent. Indeed, throughout the whole Company the staff work had been very good.

Summing up the position of the Net Revenue Account, it would be seen that they had put the maximum sum of £1,009 into the reserve fund, while £7,500 had been placed to the credit of the renewal fund—a fund which they used for expenditure which fell at infrequent intervals. They were increasing the carry-forward by £1,393. A new item was the dividend on Trade Investments. They had investments in certain businesses connected with gas manufacture, and their income from these sources gave a net return of 5% after deduction of income-tax; so they were not dissatisfied with these investments.

It was the practice of the Board at the end of one year, went on the Chairman, to look forward to the next. So far their outlook for 1936 was encouraging; but a matter which had been exercising the mind of the Gas Industry during the past few weeks was the question of coal. It would be common knowledge, of course, to all in that room that public utility undertakings throughout the Kingdom voluntarily agreed in response to a National appeal to an increase of 1s. per ton on all the coal delivered to them in respect of existing contracts over twelve months from Jan. 1, 1936. This increase had been granted on certain conditions, the most important of which was that the money should be utilized for increasing the wages of miners.

It was a matter of regret that contracts, entered into with good faith, willingly and with forethought, should be disturbed, but the opinion was held throughout the Industry that the course adopted was the right one. The public expressed great sympathy with the miners, and therefore the public would not be surprised if in the Gas Industry the various undertakings—municipal or public companies—increased the price of gas so as to cover this additional charge.

No doubt the price of coke which had already been increased on current sales would mitigate the charge falling upon the different gas undertakings; but as only half a ton of coke resulted from the carbonization of a ton of coal this would not cover the entire cost. In connection with the rise in the price of coal it had to be remembered that this would be reflected, and was, in fact, already apparent in the price of other materials which they used, such as steel or iron and other metals. The increase they proposed to make was one-tenth of a penny per therm, or, say, ½d. per 1,000 cu.ft., equivalent to an advance of 1%. To the individual consumer this would mean only a trifling sum, as they would appreciate when he told them that on a gas bill of £9 the increased sum payable would be 2s. only and so on in proportion. They did not propose to make any increase in the Oxted area, where a differential price is in force.

The Directors had increased the price with the greatest reluctance, because, by reason of the keen competition with electricity, their policy was to decrease the price of gas, not to increase it.

Public Lighting.

He had spoken on many occasions on the competition which gas was meeting with from electricity, and that competition was certainly as keen to-day as it had ever been. At Croydon a year ago he mentioned the question of public lighting. In many instances this Company had been successful in securing contracts for public lighting, and as he then informed them, the means of lighting available from gas for this purpose were efficient, and he still claimed that gas could give an entirely satisfactory light to fulfil all modern requirements. Unfortunately, some local authorities seemed to be imbued with the idea, even apart from cost, that electricity could do better than gas. Both gas and electricity had reduced prices to obtain contracts to a level which was barely, if at all, remunerative to either undertaking. This competition could benefit nobody and was to be deplored. He was sorry to say in this Company they had lost the public lighting contract in Purley and Coulsdon, notwithstanding the very advantageous terms which they offered to the Council. They had been able to obtain some small remission of their rating assessments in this area to compensate them for this loss of profit; but his main object in mentioning the matter was that he wanted to record with regret that after good service over a long period of years the contract had been transferred, and it was not fair to compare the improved lighting now given with the lighting previously given as a justification for this alteration, as they were prepared to afford a supply which would have given improved lighting with gas when the question was under review and prices were under discussion.

The position of the coal industry generally was very unsatisfactory, continued the Chairman.

The endeavour to keep inefficient pits still in operation, coupled with the system of quotas which enabled pits, even if not working, to sell their quotas or the right to produce a certain quantity of coal, threw a burden upon the efficient pits which were not working to full capacity. On the other hand, the closing of certain pits which were not fully efficient would throw out of employment a certain number of miners; but, on the other side of the picture, a large number of miners were not being employed for a full working week, and consequently were dissatisfied with their present earnings. The whole question was, in a measure, a political one, but there were other proposals now being tentatively put forward which would require careful watching by the Gas Industry and other public utility undertakings.

It was apparently intended to set up at an early date selling organizations which would tend to reduce competition between collieries and therefore artificially raise the price of coal. In this direction it was to be hoped that discrimination against buyers and particularly against public utility undertakings would not take place, and that proper safeguards for the consumer against monopoly prices being unduly raised would be provided. He was sure that this aspect of the question would not be ignored, and, further, it should be remembered that increased prices of raw material, including coal, must tend to reduce consumption—and this again in their Industry would become more marked if the increased prices were reflected in increased charges to the consumer for the ultimate commodity, whether it be gas or electric energy. The National Bodies were alive to this question and would, at the proper time and place, make representations to safeguard the interest of the consumer and the undertakers.

Mr. HENRY WOODALL, M.Inst.C.E., in seconding the resolution for the adoption of the Report and Statement of Accounts, observed that they had just heard a most able and instructive address from their Chairman. There were few undertakings whose dividends were more secure than a well-maintained gas undertaking. That morning he had visited the works, and the first thing he had seen was the new electrical installation. As they might probably know, they bought their electrical current from the Corporation, who gave them a very satisfactory supply. But it was just possible that there might be a breakdown, and so they felt they should have a plant of their own in case of such an unlikely calamity. An electrical breakdown would be a very serious matter for them indeed. Their generating station was run by a machine of 530 h.p., and from it they supplied the whole of the needs of the works. The engine was particularly easy to start up, and while he was there it was started up, and in less than two minutes it was running at full load. They would agree that it was wise to have this plant in case of need.

Last year, continued Mr. Woodall, their Chairman had been indisposed, and he had had the honour of reading his address for him. He had then made the suggestion that it would be a good thing for the shareholders to visit the works and see what a valuable property they had. Nearly 600 proprietors had accepted that invitation, and they had been very pleased to see them—though it had caused some work for the officials. He was glad that the invitation was accepted because he was sure that those who had seen gas-works before would have come to the conclusion that their own bore favourable comparison with any others they had seen, while those who had never visited a gas-works before would have been astonished at the way gas manufacture was carried out. He had great pleasure in stating that every time he visited their works he saw improvements and greater efficiency. He had pleasure in seconding the resolution proposed by the Chairman.

The CHAIRMAN, in reply to some points raised, stated that the increase in revenue from sulphate of ammonia was due to a rise in the price. This better price was mainly due to the efforts of the Sulphate of Ammonia Federation. Competition from foreign nitrate had also fallen enormously. As regards their electrical generating plant, the price at which they could manufacture all their electricity requirements for the works could not possibly be so low as that at which they bought current from the Corporation. They could manufacture it, of course, and this new plant could deal with the whole quantity required. This plant had been put in merely as a safeguard. In regard to the number of consumers, there were very few houses being put up to-day where gas was not going in. He did not think their canvassers lost any opportunity of getting gas installed wherever possible.

So far as street lighting was concerned, they were not masters of the situation. They did not have any choice as to the number necessary or where the lamps should be put, and this was one of the difficulties they had to labour under. They would like to see better lighting, but they could not control the situation.

The resolution for the adoption of the Report and Accounts was then put to the meeting and carried unanimously.

Dividends.

The CHAIRMAN thereafter proposed:

"That dividends at the following rates per annum for the half-year ended Dec. 31, 1935—viz.,

7½% on £120,000 Redeemable Preference Stock,
5% on £644,590 Maximum Dividend Stock, and
7% on £807,560 Sliding Scale Stock,

making with the interim dividend declared by the Directors and paid on Sept. 2, 1935, dividends for the year at the respective rates of 7½%, 5%, and 7%, be now declared and payable on March 2, 1936."

The proposition was seconded by Mr. HAROLD WILLIAMS, O.B.E., F.S.I., and unanimously agreed to.

Re-Election of Directors and Auditor.

Mr. HENRY WOODALL said that it was a very pleasant duty to propose the re-election of their Chairman, being one of the Directors retiring by rotation. On that side of the table they

were very proud of their Chairman, as he was sure they all were. They had in Mr. Cash a gentleman with a very wide experience, who had been on their Board for a period of 37 years, throughout which time the Company had prospered—and Mr. Cash had done a great deal to help that prosperity. No one could suggest anybody who could fill his place better.

Mr. GUY SAVORY seconded this resolution, which was enthusiastically agreed to.

The CHAIRMAN, having briefly acknowledged his re-election to the Board—during the period he had been on which he remarked that the Company's sales of gas had grown from 766 millions to 3,000 millions due to the expansion of the district and the work of the Directors and staff—went on to propose the re-election of Mr. Savory, who was the other Director retiring by rotation. Mr. Savory's name was well-known in Croydon; he was a very useful member of the Board, very regular in his attendances at their meetings in the business of the Company.

This proposition was seconded by Mr. WILLIAM CASH, Junr., and unanimously carried, Mr. SAVORY briefly acknowledging his re-election.

Thereafter, on the motion of Mr. BARHAM, seconded by Mr. TAYLOR, the retiring Auditor, Mr. F. S. Sloman, F.C.A., was re-appointed for the ensuing year. Mr. SLOMAN returned thanks for this renewal of their confidence in him.

Votes of Thanks.

The CHAIRMAN said that they never parted from these meetings without a resolution of thanks to those who had worked for them. They had a loyal staff, and they were proud to do what they could for them in various ways, including their co-partnership scheme. They valued their good relations with the staff and the work they did for them. Mr. Sandeman had been away for some time, and it was very satisfactory to know that his duties were being carried out by those immediately responsible to him. To their staff on the works and district and to the Secretary and his staff he would like to express their thanks for their work during the year. This was no mere formal resolution but a very genuine expression of appreciation. They received many letters from consumers paying tribute to the work done by their staff.

Councillor JARVIS seconded the vote of thanks and endorsed all that the Chairman had said in regard to the staff, while another shareholder supported the resolution and added his thanks for the opportunity of visiting the works last year.

Mr. F. F. WOOD acknowledged the vote of thanks on behalf of the staff and workmen. The Chairman had referred to the loyalty of their staff, and the Officers could bear testimony that that loyalty every hour of the day during the year sprang from the consideration and encouragement they always received from the Directors.

Mr. ETHERINGTON finally proposed a hearty vote of thanks to the Directors, one and all, for their efforts in bringing the Company to the state it was in to-day. It was very largely owing to the keen business instinct of the Board that the Company was so prosperous, and they were heartily grateful.

Mr. A. J. WEST, in seconding the vote, said that they looked forward to the future with every confidence; given a fair field and no favour gas had no competitor.

The vote of thanks was carried unanimously, and the CHAIRMAN briefly acknowledged it on behalf of himself and his colleagues.

The meeting then closed.

The Wandsworth and District Gas Company

The Annual Ordinary General Meeting of the Company was held at the Chief Office, Fairfield Street, Wandsworth, London, S.W. 18, on Tuesday, Feb. 18, 1936—Mr. FRANK H. JONES (Chairman and Managing Director) presiding.

The SECRETARY (Mr. W. H. Cromarty, F.C.I.S.) read the notice convening the meeting, and the Auditors' report on the balance-sheet.

The minutes of the preceding Ordinary and Extraordinary General Meetings were taken as read.

The CHAIRMAN expressed regret that three of the Company's Directors were unable to attend the meeting as the result of illness. Mr. G. F. Page and Mr. R. M. Chart were at home ill, and Mr. B. R. Green, who had been ill, had wisely gone away for a trip and was already much better. The meeting's regrets at the cause of their absence would be conveyed to them.

THE CHAIRMAN'S ADDRESS.

The CHAIRMAN, presenting the Directors' Report and Statement of Accounts for the year ended Dec. 31, 1935 (which were taken as read), first drew attention to the fact that during May last the Directors had thought it advisable to increase the capital of the Company, and an issue was made of £130,000 of 4% debenture stock; in addition, a small issue of £13,800 consolidated stock was made to satisfy the requirements of the Co-Partnership Scheme. It was issued, of course, at the full market rate.

The amount of capital expended during the year was considerably less than in the previous few years, amounting to £115,536, as against £234,417 for 1934. It was expected that this decrease in capital expenditure would continue in the next few years owing to the fact that the works had been modernized and were fully up to the requirements of the Company. New expenditure would be necessitated, of course, by mains and appliances required, owing to the development of the district.

With regard to the form of the revenue account, the Chairman recalled his statement last year that it was somewhat difficult to compare certain items with those appearing in the accounts of the year prior to that, owing to some alteration in the methods of accountancy. The same remarks applied in some degree, he said, to the figures now presented. But the re-organization of the costing system had been completed, and in future years the figures would be comparable.

Residuals had brought in approximately the same amount as in the previous year, and manufacturing costs were £666,453, against £704,051, showing a reduction in cost of manufacture of gas. That saving had been set off to some extent by the increased cost of supplying gas to the consumers, the increase being £13,000 as compared with the previous year. That increase was not incurred entirely by the addition in the number of consumers, but was a reflection on the definite policy of the Directors to provide up-to-date and economical appliances to the consumers of gas by automatic meters.

The balance carried to profit and loss account had increased as a result of the year's trading from £229,387 to £245,512.

There was little to which to draw attention in the profit and loss account, with the exception that for the last time the Company received a contribution of £726 under the Development (Loan Guarantees and Grants) Act, 1929, this comparing with £7,431 on the last account.

The funds of the Company were invested in first-class securities outside the Company's activities, with the exception of a small amount in respect of the Pension Fund. At Dec. 31, 1935, the appreciation on investments was £52,232, and the balances of the funds had since been fully invested.

Acquisition of Woking Company.

Probably the most important event during the year under review was the acquisition, by the purchase of shares, of the Woking District Gas Company. The Wandsworth Company held 92% of the stock carrying voting powers, and four of the Wandsworth Company's Directors had been appointed to the positions on the Woking Board rendered vacant by the retirement of the previous Directors. The General Manager (Mr. C. M. Croft) and the Secretary (Mr. W. H. Cromarty) of the Wandsworth Company had been appointed respectively General Manager and Secretary of the Woking Company. The latter Company was having the benefit of the technical and other staff of the Wandsworth Company, and thereby it was anticipated that considerable savings would be effected in the production and sale of gas, to the benefit of both Companies. This was not an amalgamation, but a complete purchase.

Doubtless the proprietors would remember that provisional agreements had been entered into for the amalgamation of the Leatherhead Gas and Lighting Company and the Walton-on-Thames and Weybridge Gas Company with the Wandsworth Company; the area of supply of the undertaking would thereby be extended by 54½ square miles to 131½ square miles, rendering the geographical advantages of Wandsworth more effective. The negotiations had been protracted in the case of the Leatherhead amalgamation by the action of the Surrey County Council and the Leatherhead Urban District Council, but it was hoped that the difficulties would be overcome in the near future, and that the Order would be confirmed in time to become effective by April 1 next. (In reply to a question later, the Chairman said that the Surrey County Council had withdrawn its opposition.)

With regard to Walton, the application to the Board of Trade was in preparation and, it was hoped, would be considered very shortly.

Reviewing briefly various matters of interest that had occurred during the year, the Chairman referred to the difficult situation which had arisen recently with reference to the wages of the coal miners in all the English coalfields. The Company, in common with the British Gas Industry as a whole, and other public utility undertakings, had agreed voluntarily to pay 1s. per ton extra on the price of coal, provided that the whole of the increase was handed over, without deduction, to a fund to improve the miners' earnings. An undertaking had been given

that the money would not be used for any purpose other than to pay extra wages to the miners.

That extra 1s. per ton would incur very considerable additional expenditure to the Company, and therefore, it was certain that the Directors would have to adjust the price of gas throughout the Company's area of supply. It was disappointing to have to alter the price of gas, but it was gratifying to the proprietors and Directors to know that the average selling price of gas throughout the Company's district was generally lower than the prices ruling throughout London, even in spite of an increased price, and it was hoped to be able to adopt a method of charge which would be advantageous to larger consumers.

The Company's steamers had continued to run excellently, and it was a matter for pride that the steamer "Wandle," the third of her name (her predecessor was the boat which sunk the submarine during the war) had completed 72 trips during the year under review and had delivered 152,205 tons of coal to Wandsworth. This constituted a record for coastal shipping, and was especially noteworthy when one took into consideration the considerable distance the vessel had to come up the river Thames. The record was rendered possible by the extreme loyalty and hard work of the Captain, Officers, and crew, and the rapidity with which the Company's steamers could be discharged owing to the provision of the new coal discharging pier, which was more than fulfilling expectations. The other ships of the Company had also run extremely well.

During the year nearly one mile of new mains had been laid per week, and by far the greatest length of those mains were put down to provide gas to new housing estates within the Company's area of supply. Rapidly as housing estates were developing on the district, there was still a large amount of land awaiting development, and in the near future the time would be ripe for that further development. In fact, the proprietors might congratulate themselves on having a district in which the possibilities of development were very great.

Street Lighting.

The Company had lost 15 miles of main road lighting in the Borough of Wandsworth. That was a matter of great disappointment to the Directors and staff; but to have retained that lighting would have necessitated a tender being submitted to the Council which would have incurred a very heavy financial loss to the Company, and the Directors did not consider it desirable to supply gas for street lighting at a loss and thus incur the necessity of charging the ordinary consumers, who were also ratepayers, a higher price for gas than would otherwise have been necessary, or to provide gas to local authorities at a cheaper rate than it could be supplied to the largest industrial consumers. But in spite of that loss in the Wandsworth area, it was gratifying that in the other areas of the Company there had been a considerable increase in public lighting. During the year, 15½ miles of roads had been fitted with lamps of a higher candle power, and 6½ miles of new streets had been lighted and had given satisfaction to the local authorities concerned. The increased consumption from that source was approximately 19 million cu.ft. per annum.

The number of new consumers added to the Company's books was 7,277, and excellent progress had been made in regard to the number of appliances sold. Roughly 24,000 new consumers had been added to the Company's mains during the last three years. 10,728 cookers had been sold either for cash or on hire-purchase terms; 15,262 domestic heating and hot water appliances and approximately 2,000 gas-lighted coke fires had been installed during the year. Progress in the sale of gas-operated refrigerators showed great promise, and so great was the demand for that apparatus last year that the consumers' requirements had far exceeded the makers' output; but steps had been taken to ensure that that position would not arise during the present year, and the Company could look forward with confidence to being able to meet promptly the demands for refrigerators.

It should be remembered that all this new apparatus consumed far less gas than that of a few years ago by reason of its increased efficiency, and therefore, had there not been such a large number of gas cookers, fires, &c., installed on the Company's district during the last two or three years, the increase in the sale of gas would have been considerably larger than it is at present. For the past year the increase in the sale of gas was 1%.

The offices at Wandsworth had been further extended to make provision for the additional work that was bound to arise due to the various amalgamations and the increase in the Company's business, and the whole of the staff of the Company were housed in hygienic offices under conditions as pleasant to work under as was possible. There had been a corresponding improvement in the health of the staff.

The Industrial Department had carried out extremely satisfactory work, and the increase in the quantity of gas sold for manufacturing purposes was 5% for the year. There seemed every prospect of that branch of the Company's business progressing still faster. The splendid Civic Buildings that were being constructed to accommodate the Wandsworth Borough Council would be heated entirely by gas-fired boilers, mechanically operated, a contract having been secured over a period of years. It was estimated that the consumption of gas for that purpose would be approximately 23 million cu.ft. per annum.

The Pension Fund.

With regard to the steps taken to ensure the solvency of the Pension Fund, various proposals had been discussed at a general meeting of all the members. The members of the staff had, of their own free will, agreed to pay an additional 2% of their salaries as their contribution towards ensuring the solvency of the Fund.

The demand for coke had been very heavy throughout the year and, in fact, at the moment was greater than the Company could supply. The whole of the plant at the Company's various works and on the district had been maintained at a high standard of efficiency.

The welfare of all the employees had received the usual considerate and careful attention, and the time lost through accidents and sickness was extremely low. A doctor was engaged permanently on the staff of the Company, and it was very largely due to his tact and the confidence that the staff reposed in him that the amount of sickness was so small. The number of co-partners was 1,838, and the average holding amounted to £90.

During the year the showrooms at Putney had undergone extensive alterations and the building had been made modern in appearance and was attracting additional new business. A new showroom was under construction at Esher and should be ready for opening during the next week or so. The building was situated in the heart of a rapidly developing area and would prove a valuable means of advancing the Company's interests. Over 507,000 people had visited the various showrooms of the Company during 1935 (apart from those who visited the showrooms for the purpose of paying accounts).

From the experience of the past year and the indications of the future, the Directors viewed the prospects of the Company with confidence. Since the beginning of 1936, an issue of £500,000 of 4% preference stock at 104½% was offered to the public and was immediately over-subscribed three times, indicating that the public had the greatest confidence not only in the commodity, but in the stability of the Company.

Speaking with all responsibility, the Chairman said he felt that gas to-day, as a fuel for light, heat, and power, was even more firmly established as a necessity for the public than at any other period during the considerable time in which he had been connected with the Industry.

Finally, the Chairman paid to his colleagues on the Board and to the whole of the employees a personal debt of gratitude for all they did for the Company. Co-partnership, he said, still played a great and useful part in the life of the undertaking.

He proposed the approval and adoption of the Directors' Report and Statement of Accounts for the year ended Dec. 31, 1935, as audited and certified.

Dr. T. A. IVES HOWELL (Deputy-Chairman) seconded.

The resolution for the adoption of the report and accounts was then put to the meeting, and carried unanimously.

Dividends.

The CHAIRMAN proposed that the dividends for the six months ended December, 1935, be declared at £2 10s.% on the 5% preference stock and £3 10s.% on the consolidated stock, making in all 5% and 7% respectively for the year, all less income-tax, and that the dividends be paid on March 2.

The resolution was seconded by Mr. E. SHERRARD, and carried.

Re-Election of Directors and Auditor.

Three separate resolutions were proposed by the CHAIRMAN and seconded by Mr. J. BERTRAM BROWN, that the three retiring Directors—Dr. T. A. Ives Howell, Mr. G. F. Page, and Mr. E. Sherrard—be re-elected.

The resolutions were carried; Dr. IVES HOWELL returned thanks to the proprietors for their continued confidence in him, and Mr. SHERRARD thanked them on behalf of himself and Mr. Page, who was his colleague on the Board of the old Kingston Company.

Owing to the retirement of Mr. E. L. Burton, who had served the Company very efficiently as Auditor for a great many years, the Directors had appointed Mr. B. D. Holroyd, F.C.A., to fill the vacancy. Accordingly, Mr. Holroyd offered himself for election.

On the motion of Mr. A. HARRISON, seconded by Mr. OSWALD GREEN, the meeting elected Mr. Holroyd as Auditor, at the same remuneration as previously.

Mr. HOLROYD briefly thanked the meeting.

Vote of Thanks.

Mr. E. KETTERINGHAM proposed a hearty vote of thanks to the Chairman for his very able conduct of the meeting and his concise and lucid exposition of the Company's affairs; to his co-Directors, whose wise administration had produced so excellent a result; to Mr. C. M. Croft (Chief Engineer and General Manager), and other officials; and last, but not least, to the staff as a whole, all of whom had worked so zealously in the interests of the Company.

The resolution was seconded by Mr. W. S. PIRIE and carried with enthusiasm.

The CHAIRMAN, in his response, recalled that he had been on the Board of the Company for many years, and said that whenever he felt a little unwell or tired, he came to Wandsworth, because he benefited so much from the good feeling and the spirit of keenness that existed there.

Mr. CROFT expressed thanks for the kindly references made to the staff. The past year, he said, had been a difficult one; but all in the Company's service had worked very well together, as, indeed, they did always. They all enjoyed their work, and he had noted that as the competition became keener, the interest of the Company's servants in their work became greater. He assured the meeting that its expression of thanks would be conveyed to every employee of the Company.

Gas Undertakings' Results

Barnet.

The report of the Directors of the Barnet District Gas and Water Company for the year ended Dec. 31, 1935, states that the quantity of gas sold has increased by about 8%. The profit-sharing scheme sanctioned by the proprietors at their meeting last year has been put into operation, and the relative charge appears in the accounts. After placing to renewal (gas and water) funds the authorized contributions, the payment of debenture and other interest and interim dividends for the half-year to June 30 at the authorized rate of 7% per annum on the ordinary stock and 4½% per annum on the preference stock, and the placing of £5,000 to general reserve, there remains a balance of available profit of £73,111. The Directors now recommend the declaration of dividends, less income-tax, for the half-year ended Dec. 31 last, on the ordinary stock at the rate of 7% per annum, and on the preference stock at the rate of 4½% per annum, leaving to be carried forward a sum of £51,906.

Chesterfield.

Chesterfield Corporation Gas Department has completed its financial year and the output over the previous 12 months is 15%, equivalent to 62 million cu.ft. Big business is likely to be done in the near future which may necessitate important developments. The Chesterfield Gas Committee have approved in principle a scheme for the workmen coming in contact with tar to be medically examined periodically.

East Surrey (Associated Gas and Water).

The Directors of the East Surrey Gas Company, in submitting the audited accounts for the year ended Dec. 31 last, state that during the year the Company's business has shown satisfactory expansion as indicated by the increased number of consumers, the greater quantity of gas sold, and the additional number of appliances in use. The response to the offer of Associated Gas and Water Undertakings, Ltd., to purchase the capital stocks from the holders in this undertaking, in November last, enabled the former Company to secure a majority interest. In accord therewith Messrs. Harrie Stacey and George Renton Hunt retired from the Board, after many years of valued service to the Company. To fill the vacancies thus caused Messrs. John Harry Donaldson and Alexander Edward Whitcher have been elected as representatives of Associated Gas and Water Undertakings, Ltd. Dividends at the under-mentioned rates per annum respectively—6% on the cumulative preference stock, 4½% on the redeemable preference stock, 5½% on the preference "A" stock and 6% on the ordinary "B" stock, all less income-tax—were paid for the half-year to June 30. The Directors recommend that similar dividends be paid in respect of such capital for the second half-year (less income-tax) payable on March 2 next, leaving a balance of £5,501 to be carried forward.

Liverpool.

The report of the Directors of the Liverpool Gas Company for the year ended Dec. 31 last states that the total revenue during that period was £1,402,571, and the expenditure £1,196,746, leaving a surplus of £205,825, which has been transferred to the credit of net revenue account. After deducting the amount taken for payment of the dividends on the ordinary stock declared last August and providing for the preference stock dividend for the year, together with the interest on the debenture stocks and mortgages, there remains a balance out of which the Directors recommend a dividend for the half-year ended Dec. 31 last of £3% on the ordinary stock of the Company. The Directors have to report that under the terms of the Liverpool Gas Order, 1934, the Undertaking of the Formby Gas Company, Ltd., was duly taken over in January, 1935. The Directors desire to point out that in accordance with the statement mentioned in their last report, the sum of £300,000 3¼% debenture stock (redeemable in 1964) was duly received on Jan. 1, 1935.

Portsmouth and Gosport.

The report of the Directors of the Portsmouth and Gosport Gas Company for the year ended Dec. 31, 1935, states that during the year the Company's business has shown satisfactory expansion, as indicated by the steadily increasing number of consumers and the greater quantity of gas sold, and also by the additional number of appliances in use. The Directors recommend that a dividend of 5% on the 5% maximum stock, and of 8¼% on the consolidated stock, both less income-tax, be declared for the year ended Dec. 31, 1935, and that such dividend, after deduction of the interim payment made on Sept. 2 last, be paid on March 2 next to proprietors as registered at the closing of the transfer books on Feb. 7. The amount carried forward after payment of the total dividend would be £41,465. The Special Order authorizing the acquisition of the Gosport District Gas Company as from Jan. 1, 1936, was made by the Board of Trade on Dec. 19 last. In accordance with the provisions of the Order, the name of the Portsmouth Gas Company has been changed to "Portsmouth and Gosport Gas Company" and the final dividend of the Gosport Company for the year ended Dec. 31, 1935, of £4 1s.% on the ordinary consolidated stock, and of £2 10s.% on the preference stock, both less income-tax, will be paid on March 2 next to the holders of such stocks as registered in the books of that Company on Dec. 31 last. In fulfilment of the undertaking given to the Directors of the Gosport District Gas Company that one of their number should be nominated by them for election to the Board of the amalgamated Company, it is recommended that their nominee, Mr. Frederick R. Snook, Deputy-Chairman of the Gosport Company, be elected a Director. Mr. E. Allison, M.Inst.Gas E., Engineer and General Manager of the former Gosport Company, has been appointed Engineer to the amalgamated Company.

Rochester, Chatham, and Gillingham (South-Eastern).

The Directors' report of the Rochester, Chatham, and Gillingham Gas Company for year ended Dec. 31, 1935, states that the accounts of the Company for the year show that after paying in respect of the first half-year dividends at the rate of £6 10s.% per annum, less income-tax, on the consolidated ordinary stock, £5 10s.% per annum, less income-tax, on the irredeemable preference stock, and after paying the second half-year's dividend on irredeemable preference stock, there is a total available balance of £26,824, out of which the Directors recommend the payment of the following dividend in respect of the second half-year—viz.: On the consolidated ordinary stock at the rate of £6 10s.% per annum, less income-tax, which will absorb the sum of £10,759, leaving £16,065 to be carried forward to the credit of the current year.

South Shields.

The Directors' report for the year ended Dec. 31, 1935, states that the revenue amounts to £119,933 and the expenditure to £99,810, leaving a profit of £20,122; add bank interest £68 and balance from previous year £14,182, making a total of £34,372, which it is proposed to apportion as follows: Year's dividend on consolidated stock at 8½% per annum, less income-tax, £13,822; year's dividend on ordinary stock at 5¾% per annum, less income-tax, £1,560; year's interest on mortgages, &c., £4,774; amounting to £20,156, leaving a balance to carry forward of £14,216. The quantity of gas sold during the year was 514,901,680 cu.ft., being an increase of 0·17% as compared with the previous year. The profit for the year amounts to £20,122, as compared with £20,396, for the previous year, being a decrease of £273.

Watford and St. Albans.

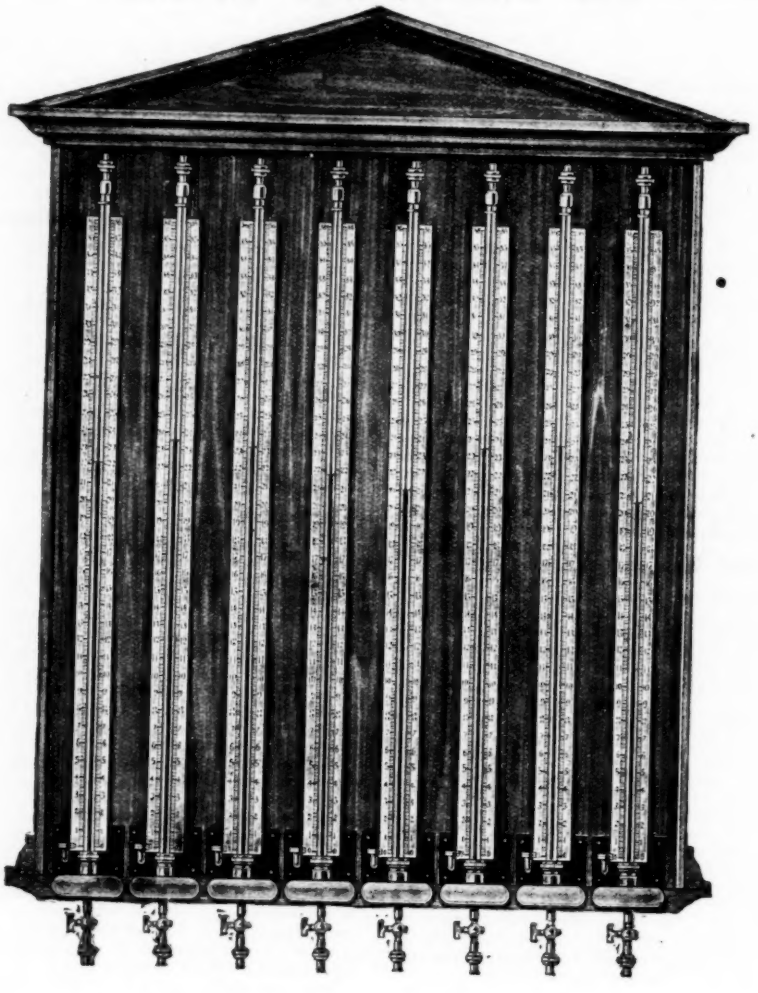
The Report of the Directors of the Watford and St. Albans Gas Company for the year ended Dec. 31, 1935, states that the gas sold during the year is once again a record figure and amounts to 1,571 million cu.ft., representing an increase of 6·35% over the corresponding 1934 sales. The gas apparatus sold also constitutes a record for the Company. The continued demand for gas for domestic and industrial purposes has made it necessary for the Directors to increase the works and mains. A large carbonizing unit has been installed at the St. Albans Works, and was put into commission during 1935. A new showroom was opened in Welwyn Garden City in October, and building was commenced on the fourteenth showroom, which is to be in North Watford. £100,000 3½% redeemable debenture stock (1975) was raised during the year on advantageous terms. After placing £1,000 to special purposes fund the revenue account shows a profit of £83,223 (against £74,553 last year), and the profit and loss (net revenue) a balance of £53,533 (against £51,350 last year), after providing for interim dividends and debenture interest and other charges. The Directors therefore recommend the payment of dividends as follows: On the 5% preference stock at the rate of £2 10s.%, making £5% for the year; on 5½% preference stock at the rate of £2 15s.%, making £5 10s.% for the year; on the 6% redeemable preference stock at the rate of £3%, making £6% for the year; and on the ordinary stock at the rate of £3 12s. 6d.%, making £7% for the year (against £6 15s.% for last year); all less income-tax.

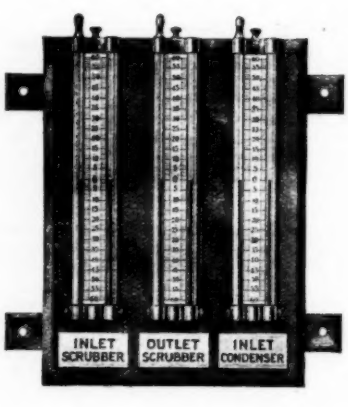
Whitby.

The report of the Directors of the Whitby Gas Company for the year ended Dec. 31, 1935, states that the profit and loss (or net revenue) account, after charging the same with interest on debenture stock, interest on preference stock, interest on banking account, interest on deposits and interest on mortgages, and after providing for the interim dividend paid to June 30 last, shows a balance of £2,209, out of which the Directors recommend the payment of dividends at the rate of £3½%, less income-tax, on the original capital, and of £2 9s.%, less income-tax, on the additional and new additional capital, for the half-year ended Dec. 31, 1935, making the interim dividends paid for the half-year ended June 30, 1935, 6½% on the original capital, and £4 11s.% on the additional and the new additional capital for the year. This will absorb £1,071, leaving a balance of £1,138 to carry forward. During the year 135 new consumers have been connected up. The output of gas shows an increase of 13,179 therms, 4¾% above the previous year. The Company installed 454 new gas appliances, including 146 cookers, 113 fires, 101 boilers, 86 other apparatus, including water heaters, &c., during the year. An increased rate of discount was allowed to a greater number of consumers. New mains have been laid and old mains re-laid in various parts of the town to meet the increased demand for gas.

[*Further Undertakings' Results will be found on p. 564.*]

GAUGE BATTERIES





No. 4. We make many types of water-tube Gauges, all of which can be mounted as batteries to any number and of any range or ranges. The illustrations show two forms, one being of a battery of 36-inch Single Tube Gauges on polished hardwood board with pediment top, and the other a small battery of three "Detachable" Gauges. Gauges can be mounted on wood or other suitable material, and quotations would be submitted on receipt of specification.

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Gas Markets and Manufactures

Stock Market Report

(For Stock and Share Lists, see later pages)

Business on the Stock Exchange did not run quite so smoothly last week and a reactionary tendency became apparent in several sections which had latterly shown increasing activity. At the commencement a wild speculative movement took place in aircraft shares, but an early bout of profit-taking soon brought down prices which closed considerably lower on the week. The L.N.E.R. decision only to maintain last year's rates of dividends came as a disappointment and investors lost interest in home rails with the result that here again prices finished well down on the week. There was another side to the picture, however, as the temporary lull in the speculative groups and the current high prices of leading industrials brought gilt-edged and other high-class investment stocks into the limelight again and many of these reached higher levels.

The Gas Market was unperturbed by any outside influences and with a good measure of support prices were well maintained and closed with little change on the week. With the exception of a number of *ex* div. markings the only movement of note was a rise of 4 points *ex* div. in Croydon sliding scale stock to 155-160, and even at the highest price of 160 at which business was recorded the yield on last year's dividend of 7% is still attractive at £4 7s. 6d.%. It will be noticed that Uxbridge ordinary on which a similar rate is paid is quoted 5 points lower, and this may be attributable to the assumption that the smaller undertaking gives less security, which is doubtless a truism in other spheres of activity but is not the case in the Gas Industry. British ordinary on which a dividend of 7½% was paid in 1934 is also quoted somewhat on the low side and was marked up one point last week to 153-158, the yield in this case on the middle market price being £4 16s. 5d.%.

Current Sales of Gas Products

The London Market for Tar Products.

Feb. 24.

There is little change to report in the prices of tar products, which are as follows:

Pitch, about 43s. 6d. per ton f.o.b.

Creosote, about 5½d. per gallon.

Refined tar, about 3¾d. per gallon in bulk at makers' works.

Pure toluole 2s. 9d. to 2s. 10d.; pure benzole, 1s. 7d. to 1s. 8d.; 95/160 solvent naphtha, 1s. 8d. to 1s. 9d.; and 90/160 pyridine, about 4s. 9d., all per gallon naked at makers' works.

Tar Products in the Provinces.

Feb. 24.

The average prices of gas-works products during the week were: Gas-works tar, 24s. 3d. to 29s. 3d. Pitch—East Coast, 42s. 6d. to 45s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 42s. 6d. to 45s.* Toluole, naked, North, 2s. 2d. to 2s. 4d. Coal-tar crude naphtha, in bulk, North, 8d. to 8¼d. Solvent naphtha, naked, North, 1s. 6d. to 1s. 6½d. Heavy naphtha, North, 1s. to 1s. 1d. Creosote, *ex* works, in bulk, North, liquid and salty, 4⅝d. to 4⅞d.; low gravity, 4⅜d. to 4⅝d. Heavy oils, in bulk, North, 4¾d. to 5d. Carbolic acid 60's, 2s. 4d. to 2s. 6d. Naphthalene, £19 to £21. Salts, 95s. to 100s., bags included. Anthracene, "A" quality, 2½d. to 3d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Feb.* 22.

Conditions in this district continue active with prices of almost all products very firm.

Crude gas-works tar.—The actual value is 30s. to 31s. per ton *ex* works in bulk.

Pitch remains dull at 35s. to 37s. 6d. per ton f.o.b. Glasgow for export, and 35s. per ton *ex* works in bulk for home trade.

Refined tar is in quite good call for both prompt and forward delivery and price is well maintained at 2⅝d. to 3d. per gallon f.o.r. makers' works naked.

Creosote oil.—A steady throughput is maintained at the following prices: B.E.S.A. Specification, 5¼d. to 5⅝d. per gallon; low gravity, 5¼d. to 5½d. per gallon; and neutral oil, 5¼d. to 5½d. per gallon; all f.o.r. in bulk.

Cresylic acid.—A considerable volume of business has been placed during the week and the following prices have been offered and accepted: Pale, 97/99%, 1s. 5d. to 1s. 5½d. per gallon; dark, 97/99%, 1s. 3½d. to 1s. 4d. per gallon; and pale, 99/100%, 1s. 7d. to 1s. 8d. per gallon; all *ex* works naked.

Crude naphtha is only available in small quantities and value is unchanged at 5¼d. to 5⅝d. per gallon, according to quality and district.

Solvent naphtha.—90/160 grade is 1s. 4½d. to 1s. 5½d. per gallon, and 90/190 heavy naphtha is 1s. to 1s. 1d. per gallon.

Motor benzole is commanding 1s. 3½d. to 1s. 4d. per gallon in bulk at makers' works.

Pyridines.—90/160 grade is 4s. 6d. to 5s. per gallon, and 90/140 grade 5s. to 5s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s. d.		s. d.	
Crude benzole . . .	0 9½	to	0 10	per gallon at works
Motor ,, . . .	1 3	,,	1 3½	,, ,, ,,
90% ,, . . .	1 4	,,	1 4½	,, ,, ,,
Pure ,, . . .	1 7½	,,	1 8	,, ,, ,,

Contracts Advertised To-Day

Coal.

Clacton Gas Department. [p. 569.]
Milford Haven Gas Department. [p. 570.]

Coke Screening Plant.

Newton-in-Makerfield Gas Department. [570.]

Lighting Goods (Mantles and Fittings).

Spenborough Gas Department. [p. 570.]

Meters, &c.

Spenborough Gas Department. [p. 570.]

Pipes and Specials, &c.

Clacton Gas and Water Department. [p. 569.]
Spenborough Gas Department. [p. 570.]

Purifiers and Washing Plant.

Newton-in-Makerfield Gas Department [p. 570.]

Stores.

Spenborough Gas Department. [p. 570.]

Further Gas Undertakings' Results

Ilfracombe.

The Directors' Report on the working of the Ilfracombe Gas Company for the year ended Dec. 31, 1935, states that the profit and loss account shows an available balance of £2,788 after paying an interim dividend of £2 10s.% on the preference stock, and £3 5s.% on the consolidated ordinary stock. The Directors recommend a further payment of £2 10s.% on the preference stock, and £3 5s.% on the consolidated ordinary stock. The sale of gas during 1935 shows an increase over that of the previous year, and the number of consumers and sales of appliances continue to grow. The Directors have prepared a scheme of superannuation for the benefit of the members of the Company's staff and employees which will be submitted to the stockholders for their approval.

York.

The Report and Accounts of the York Gas Company show that the year's working has resulted in a profit of £18,545, as compared with £19,323 for the previous year. After providing for interest on debentures and dividends on the preference and ordinary stocks the sum of £9,014 has been carried forward. Despite adverse weather conditions, fierce competition from electricity, and the loss of public lighting, the total income has increased by £6,717, and now amounts to £172,969. The revenue from the sale of gas is larger by £4,955. During the last five years £90,000 has been spent on modernization and writing off £55,000 in respect of depreciation in equipment. The Company have entered into a contract with the London and North-Eastern Railway to supply gas for their local requirements, and the sale of gas for industrial purposes continues to increase. The output of gas in therms has increased by 7·38%, to 4,226,845, and the sale of coke has increased in proportion to the larger tonnage of coal carbonized. Over £1,732 more has been spent on coal than in the previous year; repairs and maintenance to works and plant have cost more by £2,575. This increase is more apparent than real as last year's expenditure was exceptionally low. The increase of £1,523 in the repair, maintenance, and renewals of mains and service pipes is partly due to continued activity in the building trade. £4,000 has been placed to the credit of the special purposes fund and the Company have drawn upon this fund for £2,285 in respect of vertical retort repairs, and for £617 in respect of mains and services rendered useless by reason of Slum Clearance.

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- THE WEST LIP-BUCKET CONVEYOR WITH AUTOMATIC LUBRICATION
- COKE GRADING AND PREPARATION UNITS

Contracts placed with West's Gas Improvement Company, Ltd., during the past year have included carbonizing plant installations for the Gas Undertakings of Buxton, Slough, *Salford, *Wellingborough, *West Bromwich, *Romford, and *Dudley in England; Kilsyth, *Montrose, and Kelso in Scotland; Newry in Ireland; *South Brisbane in Australia; Svendborg in Denmark; Mataro in Spain; and *Vannes and *Tarbes in France.

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Official Quotations on the London Stock Exchange

Issue. £	Stock or Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Feb. 21.	Rise or Fall on Week	Transactions, Lowest and Highest Prices During the Week.
1,551,868	Stk.	Sept. 9	7	7	Alliance & Dublin Ord. ...	145—155	...	152
374,000	,,	Dec. 16	4	4	Do. 4 p.c. Deb. ...	95—100	...	...
557,655	,,	Feb. 17	7	7	Barnet Ord. 7 p.c.	164—169*	−3	...
300,000	1	Oct. 7	1 9½	1 4½	Bombay, Ltd.	1 1⅝—1 1⅝	...	26/6—27/-
179,305	Stk.	Aug. 12	9½	9½	Bournemouth sliding scale ...	222—232	...	...
590,407	,,	,,	7	7	Do. 7 p.c. max. ...	172—177	+1	174—177
493,960	,,	,,	6	6	Do. 6 p.c. Pref. ...	150—155	...	153—155
50,000	,,	Dec. 16	3	3	Do. 3 p.c. Deb. ...	85—90	...	...
262,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	105—110	...	108½—110
335,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	125—130	...	...
357,900	,,	Feb. 17	7½	7½	Brighton, &c., 6 p.c. Con. ...	167—172*	−3	...
649,955	,,	,,	6¾	6¾	Do. 5 p.c. Con. ...	153—158*	−3	159
205,500	,,	,,	6	6	Do. 6 p.c. 'B' Pref.	143—148*	+1	144—144½
855,000	,,	Sept. 23	8	7	British Ord.	153—158	+1	...
100,000	,,	Dec. 16	7	7	Do. 7 p.c. Pref.	153—158	...	...
350,000	,,	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	96—101	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	107—112	...	...
200,000	,,	,,	17/6⅝	3½	Do. 3½ p.c. Red. Deb. ...	98—100	...	...
100,000	10	22 May '33	6	4	Cape Town, Ltd.	1—3	...	...
100,000	10	6 Nov. '33	4½	4½	Do. 4½ p.c. Pref. ...	1—3	...	...
150,000	Stk.	Jan. 6	4½	4½	Do. 4½ p.c. Deb. ...	81—86	...	...
626,860	,,	Feb. 3	6	6	Cardiff Con. Ord.	131—136	...	...
98,936	1	Sept. 23	2/-	2 -	Colombo, Ltd., Ord.... ...	1 5/8—1 7/8	...	...
24,500	1	,,	1 4½	1 4½	Do. 7 p.c. Pref. ...	20/-—22/-	...	...
609,204	1	Oct. 7	- 11·48	- 11·48	Colonial Gas Assn. Ltd. Ord.	19 6—21 6	...	20 6—21/-
296,053	1	,,	13·30	13·30	Do. 8 p.c. Pref.	23 6—25 6	...	24/-—24 6
1,775,005	Stk.	Feb. 3	5	5	Commercial Ord.	98—103	...	103
620,000	,,	Dec. 2	3	3	Do. 3 p.c. Deb. ...	85—90	...	87
286,344	,,	Feb. 17	5	5	Do. 5 p.c. Deb. ...	119—124*	−2	...
807,560	,,	,,	7	7	Croydon sliding scale ...	155—160*	+4	155½—160
644,590	,,	,,	5	5	Do. max. div.	113—118*	−2	117
620,385	,,	Dec. 16	5	5	Do. 5 p.c. Deb.... ...	121—126	...	...
239,000	,,	Feb. 3	5	5	East Hull Ord. 5 p.c.... ...	107—110	...	108
181,625	,,	Feb. 17	6	6	East Surrey Ord. 5 p.c. ...	130—135*	−2	...
175,609	,,	Dec. 16	5	5	Do. 5 p.c. Deb. ...	122—127	...	127
19,284,128	,,	Feb. 3	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	27 6—28 6a	...	27 10½—28 3
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	88—91	...	90½—91½
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	107—110	...	108—109
8,602,497	,,	Dec. 2	3	3	Do. 3 p.c. Con. Deb. ...	91—94	...	91—92½
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	117—120	...	118—119¼
3,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	114—117	...	114½—115
270,466	,,	Feb. 17	6	6	Harrogate New Cons. ...	130—135*	−2	...
140,000	1	Sept. 23	1 7½	1 7½	Hongkong & China, Ltd. ...	1 1—1 1	...	...
213,200	Stk.	Aug. 12	6	6	Hornsey Con. 3½ p.c. ...	137—142	...	...
5,600,000	,,	Nov. 4	14	8	Imperial Continental Cap. ...	175—180	...	175½—178
223,130	,,	Jan. 20	3½	3½	Do. 3½ p.c. Red. Debs.	92—97	...	...
285,242	,,	Feb. 17	8½	8½	Lea Bridge 5 p.c. Ord. ...	172—177*	−3	...
165,736	,,	Aug. 26	10	8	Maidstone 5 p.c. Cap. ...	182—192	...	...
63,480	,,	Dec. 16	3	3	Do. 3 p.c. Deb. ...	80—85	...	83¼—84½
75,000	,,	Dec. 2	†10	†10	Malta & Mediterranean	200—210	...	...
					Metropolitan (of Melbourne)			
392,000	—	Oct. 1	5½	5½	5½ p.c. Red. Deb.	102—107	...	...
231,978	Stk.	Feb. 17	5	5	M.S. Utility 'C' Cons. ...	110—115*	...	...
818,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	100—105*	−2	102—104½
360,075	,,	Dec. 16	4	4	Do. 4 p.c. Deb. ...	103—108	...	...
148,955	,,	,,	5	†5	Do. 5 p.c. Deb. ...	120—125	...	...
125,000	—	Jan. 2	3½	3½	Do. 3½ p.c. Rd. Rg. Bds.	96—99	...	...
675,000	Stk.	Nov. 18	†3	†3	Montevideo, Ltd.	60—65	...	...
225,000	,,	Feb. 17	7½	7½	North Middlesex 6 p.c. Con.	169—174*	−3	171½—172½
396,160	,,	Feb. 3	5	5	Northampton 5 p.c. max. ...	103—108	...	...
300,000	,,	Nov. 4	†7	†9	Oriental, Ltd....	167—172	...	169
416,617	,,	Dec. 16	8	8	Plymouth & Stonehouse 5 p.c.	162—167	...	...
504,416	,,	Feb. 3	8¼	8¼	Portsm'th Con. Stk. 4 p.c. Std.	170—175	...	...
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	108—113	...	...
114,000	,,	Feb. 3	5	5	Preston 5 p.c. Pref.	110—115	...	...
321,961	1	Sept. 23	...	1/-	Severn Val. Gas Cor. Ld. Ord.	22/-—23/-	...	22/-—22/3
319,510	1	,,	...	-/10½	,, ,, 4½ p.c. Cum. Pref.	21 9—22 9	...	...
133,201	Stk.	Feb. 17	8½	5	Shrewsbury 5 p.c. Ord. ...	145—150*	−2	...
90,000	10	May 27	†3	†3½	South African...	3—4	...	...
1,061,779	1	Sept. 23	1 2½	1 2½	South East'n Gas Cn. Ld. Ord.	27/6—28 6	...	28/-
845,016	1	,,	- 10½	- 10½	Do. 4½ p.c. Red. Cum. Pref.	22 3—23 3	...	22/4½—22/6
200,000	1	,,	...	4	Do. 4 p.c. Cum. Pref. ...	21/-—22/-	...	...
450,000	Stk.	Feb. 17	4	4	Do. 4 p.c. Red. Deb. ...	101—104*	+1	...
6,709,895	,,	Feb. 3	5	6½	South Met. Ord.	126—129	−3	126½—129½
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf....	147—152	...	150
850,000	,,	,,	4	4	Do. 4 p.c. Irred. Pf....	103—107	...	...
1,895,445	,,	Dec. 16	3	3	Do. 3 p.c. Deb. ...	88—91	...	89—90½
1,000,000	,,	Jan. 6	5	5	Do. 5 p.c. Red. Deb.	114—117	+1	115—116⅜
1,543,795	,,	Feb. 3	6	6	South Suburban Ord. 5 p.c....	130—135	...	...
512,825	,,	,,	5	5	Do. 5 p.c. Pref....	120—125	...	...
500,000	,,	,,	4	4	Do. 4 p.c. Pref....	102—107	...	...
888,587	,,	Dec. 16	5	5	Do. 5 p.c. Deb....	123—128	...	...
250,000	,,	,,	4	4	Do. 4 p.c. Deb....	103—108	...	...
415,907	,,	Dec. 2	...	4	S. Western Gas & Water Ord.	23/-—24/-	...	...
160,523	,,	Oct. 21	...	...	Do. 4½% Red. Cum. Pref.	22/-—23/-	...	22/6—22/9
110,000	,,	Dec. 16	4	4	Do. 4% Red. Deb. ...	98—103	...	...
647,740	,,	Feb. 3	5	5	Southampt'n Ord. 5 p.c. max.	113—118	...	...
121,275	,,	Dec. 16	4	4	Do. 4 p.c. Deb.	98—103	...	...
350,000	,,	Feb. 3	5½	5½	Swansea 5½ p.c. Red. Pref. ...	111—116	...	...
200,000	,,	Dec. 16	6½	6½	Do. 6½ p.c. Red. Deb. ...	96—101	...	...
94,000	,,	...	...	...	Do. 3½ p.c. Red. Deb. ...	96—101	...	...
1,076,490	,,	Feb. 17	6½	6½	Tottenham and District Ord.	149—154*	−1	150—154
409,835	,,	,,	5½	5½	Do. 5½ p.c. Pref....	128—133*	−2	...
62,235	,,	,,	5	5	Do. 5 p.c. Pref. ...	118—123*	−2	...
371,850	,,	Dec. 2	4	4	Do. 4 p.c. Deb. ...	103—108	...	...
369,774	,,	Feb. 3	7	7	Uxbridge, &c., 5 p.c. ...	150—155	...	155
108,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	115—120	...	...
1,340,521	,,	Feb. 3	7	7	Wandsworth Consolidated ...	158—163	...	159—162
1,371,373	,,	,,	5	5	Do. 5 p.c. Pref. ...	122—127	...	125—126
1,317,964	,,	Dec. 16	5	5	Do. 5 p.c. Deb. ...	123—128	...	...
338,300	,,	,,	4	4	Do. 4 p.c. Deb. ...	102—107	...	...
499,735	,,	Feb. 17	6¾	7¼	Watford and St. Albans Ord.	155—160*	−2	157½—159¾
200,000	,,	,,	5	5	Do. 5 p.c. Pref. ...	118—123*	−2	...
200,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	133—138*	−2	...
200,000	,,	Dec. 2	4	4	Do. 4 p.c. Red. Deb.	98—103	...	...
100,000	,,	,,	...	3½	Do. 3½ p.c. Red. Deb.	96—101	...	...
158,400	,,	Aug. 12	6b	5	Winchester W. & G. 5 p.c. Con.	114—119	...	...

a.—The quotation is per £1 of Stock. b.—Paid £3, including 10s. on account of back dividends. * Ex div.
† Paid free of income-tax. ‡ For year. § Actual for three months.

Stock and Share List continued overleaf.

STOCK FOR SALE.

By Order of the Directors.

UXBRIDGE, MAIDENHEAD, WYCOMBE, AND DISTRICT GAS COMPANY.

Messrs. A. & W. RICHARDS

are Instructed to OFFER FOR SALE BY TENDER

£37,580

FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

Minimum Price of Issue, £103 per £100,

Yielding at that Price £3 17s. 8d. per cent. Also

£24,680

FIVE PER CENT. PREFERENCE STOCK.

Minimum Price of Issue, £125 per £100,

Yielding at that Price £4 per cent.

Prospectus and Forms of Tender (which latter must be sent in by 11 o'clock on Tuesday, March 3rd) may be obtained of A. & W. RICHARDS, 37, WALBROOK, E.C. 4.

STOCK AND SHARE LIST—Cont.

Stocks Officially Quoted on Provincial Exchanges

Issue. £	Stock or Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations. Feb. 21.	Rise or Fall on Week.	Transactions, Lowest and Highest During the Week.
BRISTOL EXCHANGE.								
347,756	Stk.	Feb. 3	5	6¼	Bath Cons.	124—126	...	...
1,447,250	,,	Feb. 17	5	5¼	Bristol, 5 p.c. max.	119—121*	—1	...
120,420	,,	Dec. 16	4	4	Do. 1st 4 p.c. Deb. ...	102—104	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	102—104	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	125—128	...	...
274,000	,,	Feb. 17	5	5	Newport (Mon.) 5 p.c. max....	111—116*	—2	...
13,200	12	Aug. 26	8½	7	Pontyp'l Gas & W. 10 p.c. 'A.'	14½—15½	...	...
13,600	10	,,	6	5	Do. 7 p.c. 'B.'	11½—12½	...	...
40,000	10	,,	6	5	Do. 7 p.c. 'C.'	11½—12½	...	...
140,778	Stk.	Feb. 17	5	5	Weston-super-Mare Cons. ...	113—115*	—2	...
64,338	,,	Dec. 16	4	4¼	Do. 4 p.c. Deb.	98—100	...	...
33,340	,,	,,	7½	7½	Do. 7½ p.c. Deb.	165—169	...	...
LIVERPOOL EXCHANGE.								
157,150	Stk.	Feb. 3	5	6½	Chester 5 p.c. Ord.	107½—112½	...	...
92,500	,,	Dec. 16	4	4	Do. 4 p.c. Pref.	100—105	...	...
32,540	,,	,,	3½	3½	Do. 3½ p.c. Deb. ...	91—96	...	...
41,890	,,	,,	4	4½	Do. 4 p.c. Red. Deb. ...	100—105	...	...
2,167,410	,,	Feb. 17	6	6	Liverpool 5 p.c. Ord. ...	134—136*	—1½	135
245,500	,,	Dec. 16	5	5	Do. 5 p.c. Red. Pref. ...	103—108	...	...
306,083	,,	Jan. 6	4	4½	Do. 4 p.c. Deb. ...	105—107	...	...
106,280	,,	Feb. 3	10	10	Preston 'A' 10 p.c. ...	202—212	...	...
188,219	,,	,,	7	7	Do. 'B' 7 p.c.	140—150	...	...
NEWCASTLE EXCHANGE.								
122,577	Stk.	Aug. 12	8	8	Blyth 5 p.c. Ord.	151—153	...	...
732,000	,,	Feb. 3	5	5	Hartlepool G. & W. Cn. & New	118—120	...	...
2,061,315	,,	Feb. 3	5	5⅛	Newcastle & Gateshead Con.	24 9—25 6*a*	...	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	106½—107½	...	...
776,706	,,	Dec. 16	3½	3½	Do. 3½ p.c. Deb. ...	100½—101½	...	...
277,285	,,	Oct. 21	5	5	Do. 5 p.c. Deb. '43...	105—106	...	...
209,820	,,	Aug. 12	8½	8½	South Shields Con.	173—175	...	...
299,542	,,	Feb. 3	6	6	Sunderland 6 p.c. max. ...	129—131	...	...
NOTTINGHAM EXCHANGE.								
542,270	Stk.	Feb. 17	7	10	Derby Con.	172—182*	—3	...
55,000	,,	Dec. 16	4	4	Do. 4 p.c. Deb.	100—105	...	...
84,750	,,	Feb. 17	5	12	Long Eaton 'A' Ord. ...	150—160*	...	...
50,000	,,	,,	4	10	Do. 'B' Ord. ...	130—140*	...	...
20,000	10	June 7	5	5	Do. 5 p.c. Pref. ...	10—12	...	...
80,000	Stk.	,,	5	5	Do. 5 p.c. Deb. ...	117—122	...	...
SHEFFIELD EXCHANGE.								
10,000	Stk.	Aug. 26	10	10	Great Grimsby 'A' Ord. ...	220—230	...	...
6,500	,,	,,	10	10	Do. 'B' Ord. ...	220—230	...	...
79,000	,,	,,	10	10	Do. 'C' Ord. ...	205—215	...	...
1,806,339	,,	Aug. 26	6	6	Sheffield Cons.	144—147	...	...
95,000	,,	Dec. 16	4	4	Do. 4 p.c. Deb.	100½—102½	...	...

a The quotation is per £1 of Stock.

Supplementary List of Stocks and Shares not Officially Quoted

202,152	1	...	...	...	Ascot Ord.	112—117	...	...
128,182	1	...	...	...	Do. 5 p.c. Pref.	117—122	...	...
90,000	1	Nov. 4	5	5	Assd. Gas and Water Ord....	21/—23/-	...	...
90,000	1	,,	4½	4½	Do. 4½ p.c. Cum. Pref. ...	22/—23/-	...	...
17,000	Stk	Feb. 17	8	8	Bognor Orig. Ord. 'A' ...	162—172*	—2	...
62,210	,,	,,	8	8	Do. New Addl. 'A' ...	162—172*	—2	...
87,160	,,	,,	7	7	Do. New 7 p.c. max. ...	140—145*	—2	...
37,440	,,	Feb. 3	10	10	Cam.Univ. & Town 10 p.c.max.	210—220	...	...
125,970	,,	,,	7	7	Do. 7 p.c. max.	158—163	...	...
39,025	,,	,,	5	5	Do. 5 p.c. max.	108—113	...	...
65,000	,,	Aug. 12	8½	7½	Eastbourne 'A' 5 p.c. ...	153—158	...	...
198,000	,,	,,	7	6	Do. 'B' 3½ p.c.	135—140	...	...
112,312	,,	,,	5	5	Do. 5 p.c. Pref.	120—125	...	...
130,000	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	122—127	...	...
250,000	1	Nov. 18	...	4	Gas Consolidation Ord. ...	20 6—22 6	...	...
250,000	1	,,	...	4	Do. 4 p.c. Red. Cum. Pref.	19 6—20 6	...	19/10½—20/-
117,251	Stk.	Sept. 23	8 1/10	8 1/10	Gosport District Cons. ...	177—182	...	...
73,350	,,	,,	5	5	Do. 5 p.c. Pref.	113—118	...	...
24,000	30	Feb. 3	8½	8½	Great Yarmouth 8½ p.c. max.	52—57	...	...
59,400	30	,,	7½	7½	Do. 7½ p.c. max.... ...	42—45	...	48
51,160	Stk.	Dec. 2	5½	5½	Do. 5½ p.c. Deb.... ...	123—128	...	...
152,600	,,	Aug. 26	8	8	Guildford Cons.	175—180	...	...
54,055	,,	,,	5	5	Do. 5 p.c. Pref.	116—121	...	...
68,250	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	120—125	...	...
156,600	,,	Feb. 3	7½	7½	Hampton Court Cons. ...	167—177	...	...
81,660	10	Feb 4,'35	5	9	Leatherhead Ord.	16—17	...	...
107,960	10	Sept. 23	5	4	Mid Kent Ord.	9½—10½	...	...
230,940	Stk.	Feb. 17	10	10	Oxford & District Ord. ...	212—222*	—3	...
47,112	,,	,,	5	5	Do. 5 p.c. Pref.	115—120*	—2	...
50,000	,,	,,	6	6	Do. 6 p.c. Red. Pref. ...	113—118*	—2	...
126,193	,,	Nov. 18	7½	7½	Peterborough Ord.	160—170	...	...
64,990	,,	Sept. 9	7½	6½	Redditch Ord.	116—121	...	...
166,850	,,	Feb. 17	7	9	Romford Ord.	167—172*	...	...
60,000	,,	,,	4	4	Do. 4 p.c. Pref.	97—100*	...	...
44,000	,,	Sept. 23	5	5	Do. 5 p.c. Deb.	122—127	...	...
10,950	,,	Aug. 26	8	8	Ryde Ord.	168—173	...	...
136,191	,,	Feb. 3	5	7	Scarborough Ord.	128—138	...	...
27,825	,,	Feb. 3	8	8	Shanklin & Ventnor Cons. ...	152—162	...	...
40,643	,,	Sept. 23	7	7	Slough Ord.	150—155	...	...
221,000	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	116—121	...	...
28,872	1	Nov. 4	5½	5½	S. Midland Gas Cpn.Ltd. Ord.	20/—22/-	...	...
28,866	1	Sept. 9	4½	4½	Do. 4½ p.c. Red. Cum Pref.	20/—22/-	...	...
24,930	Stk.	Feb. 17	7	7	Southgate & Dist. 7 p.c. max.	148—153*	—2	...
162,500	,,	,,	5	5	Do. 5 p.c. Pref.	115—120*	—2	...
117,228	,,	Aug. 12	6	5	Swindon Cons.	113—118	...	...
60,425	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	122—127	...	...
50,000	1	...	...	...	Utd. Kingdom Gas Cpn. Ord.	1 1/16—1 1/16	...	20/6—21/6
760,910	1	Nov. 18	...	2½	Do. 4½ p.c. Prefd. Ord....	20/—21/-	...	...
110,910	1	,,	...	2½	Do. 4½ p.c. Cum. Pref. ...	20 6—21 6	...	...
900,000	Stk.	,,	...	...	Do. 3½ p.c. Red. Deb. ...	98—101	...	...
130,000	,,	Feb. 3	5	8	Wakefield Ord.	137—142	...	...
81,650	,,	,,	5	5	Do. 5 p.c. max.	101—106	...	...
82,000	,,	Feb. 3	6	6	Weymouth Ord.	106—111	...	...
70,000	,,	Feb. 3	4	6	York Cons.	107—112	...	...
390,000	,,	Dec. 16	5	5	Do. 5 p.c. Red. Deb. ...	103—108	...	...
133,640	,,	Feb. 3	6½	6½	Yorktown (Cam.) 5 p.c. Cons.	118—123	...	...
120,000	,,	,,	5	5	Do. 5 p.c. Pref.	115—120	...	...
35,000	,,	Dec. 16	5½	5½	Do. 5½ p.c. Deb.... ...	130—135	...	...

"Modern Gas Fitting"

PART VI.

of

Gas Fitting Pamphlets

Another of the Popular Series of reprints, in booklet form, of the articles on "Modern Gas Fitting," contributed monthly to the

"GAS SALESMAN"

by

R. N. LeFevre, M.Inst.Gas E.

Officer-in-Charge of Training, The Gas Light and Coke Company, Assistant Head of Department of Gas Engineering and Supply, Westminster Technical Institute.

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